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SPRING CONSTRUCTION TIME HERE-- SITUATION AT WASHINGTON

Telephone construction problems present several new angles to operating companies this spring. As everybody knows, most companies for several years past have been deferring all but the most necessary work because of abnormal business conditions. This policy, of course, has only brought nearer the inevitable day when the additional expense *must* be incurred.

Now that business is picking up, the need for adequate construction and repair work can no longer be ignored. The return of telephones to service is an infallible sign that recovery has started, and shows the company management that the waiting period is over.

The plant must be put in shape to handle the increased demand that is beginning to make itself felt. There can be no more marking of time if the company is to participate in the return of better times.

* * * *

Some belated buyers may complain that prices of equipment and supplies are higher than a year ago, but they should not permit this fact to induce them to postpone buying any longer. The signs in all lines of industry point to a greater advance in costs within the next six months, and the universal opinion is held that the purchasers of so-called capital goods and materials now will have cause to congratulate themselves before the year closes.

There is a distinct trend toward higher levels for all basic commodities, that enter into construction and building operations.

Telephone buyers should remember that their manufacturers and supply dealers have encountered serious difficulties during the past three years, with a greatly reduced volume of business and at the same time abnormally low prices for their products. Industrial code requirements also have added to their expense in operating their factories in recent months.

The comparatively slight advance in equipment and supply prices this year should not deter telephone operating companies from placing orders promptly covering needed merchandise, for, as before stated, it is considered altogether probable that the trend will be still higher before many months elapse.

Washington leaders frankly admit they are planning for a gradual rise in prices of materials in the capital goods industries, as the next important move to speed up business recovery. Such an advance, combined with the increase in production expenses due to code provisions, is sure to compel a rise in merchandise prices, and that with the approval of government leaders.

* * * *

No company that hopes to share in the revival of business recovery will fail to keep up its maintenance work. The best argument to secure the re-installation of discontinued stations is the proof that the service is adequate and efficient—in fact, worth while being restored—and that, of course, means a plant kept in good working order.

Right here it is well for telephone managers to consider a point that all lines of business are finding out: That is, that with the resumption of business activity, all buyers are showing themselves to be more particular in getting their money's worth. The average person today is less careless in his spending than back in the boom days. He appreciates more the value of a dollar and is loath to part with money.

Those who sell him service or merchandise must deliver the real goods. This applies to telephone service as well as to a pair of shoes or a suit of clothes.

We advise all companies to get their supplies in early, and utilize these spring days to put their plants in shape to render satisfactory service. It is a good idea, too, to let your subscribers know that what you are doing in their behalf. By showing them you are on the job, you will improve your company's public relations.

* * * *

The road work of the federal authorities has necessitated the moving of many poles. One of the leading pole producers, in a letter to TELEPHONY, offers this pertinent suggestion:

"The government's road-building program, which in many cases necessitates the widening of highways and the moving back of pole lines, affords a good opportunity to rebuild and renew lines of communication. Reasonable financing is now available

in almost every section for legitimate replacement of lines. It, therefore, should be the first thought of every telephone company to bring its lines up to date so it can furnish the best possible service.

Prices are already beginning to rise on poles, wire and all line equipment, but they are still much lower than they will be a few months hence. Every company should, therefore, make a careful examination of its pole lines and make the necessary replacements while the work can be done on an economical basis."

* * * *

Relative to the trend toward rising prices in the capital industries, recent business statistics are cited as indicating this upward movement. In March building permits in 215 American cities were 32 per cent higher than in February.

Steel operations show a gain, which indicates growing recovery in the "heavy" industries using metal products. The Youngstown district, for instance, is operating at nearly 60 per cent of capacity. Automobile financing for January and February was nearly 100 per cent over the same period in 1933.

Incidentally, an important straw on improving business conditions is the announcement that March was the tenth consecutive month in which the Bell System showed a monthly gain in net income.

Better times will mean rising commodity prices, which suggests to the prudent buyer not to delay in placing his orders.

The Washington Situation.

Those interested in communications affairs, who have kept their ears cocked toward Washington to note what the government is planning, now have another development to watch. Counting the Dill and Rayburn Communications Commission bills and the telephone code negotiations, this makes a three-ring circus where plenty is going on affecting the wire and radio services.

This latest factor is the Splawn report on holding companies. The public has grown used to associating holding company investigations with the electric power industry, so there was surprise in most quarters that Dr. Splawn's report to Congress devoted so much attention to holding concerns in the telephone field.

The average newspaper reader expects the holding company investigations to flay the "power trust," with the Insull combination held up as the "horrible example." However, so far as the press has delved into the ponderous document prepared by Dr. Splawn—it contains 323 pages—the comment centers around the parent corporation of the Bell organization, and his severe criticism of some of its methods.

Anyway, the newspaper headlines have been chiefly devoted to the A. T. & T. Co., its corporate methods, financial set-up and even the salaries paid its officials. The Splawn revelations and recommendations made interesting reading for all telephone men—especially those whose names were not mentioned.

* * * *

It is said that Dr. Splawn had been working on this holding company inquiry nearly three years. It must have been a congenial task, for he now urges that another year be devoted to another special investigation of the larger companies, which he estimates will cost between $500,000 and $1,000,000.

If such an inquiry is undertaken, it is probable that the new Federal Communications Commission will direct it and await its conclusions, for the information collected would have a direct bearing on the future policies of this agency of the New Deal which aims to regulate communications services.

No doubt all the companies engaged in these services would gladly see the federal commission postponed for a year, barring the Postal Telegraph and its owner, the International Telephone and Telegraph Corp., which would welcome speedy action to place the Postal where its unprofitable operations would be less burdensome. All other companies in the communications field would willingly defer this New Deal plan indefinitely.

The I. T. & T. Co. hopes that some deal will develop from this proposed legislation to adjust the telegraph situation and improve its subsidiary's—the Postal's—financial position.

* * * *

The most surprising statement in the Splawn report is that the holding company has proved as "prolific of abuses" in the communications industry as in the electric power field. These are harsh words, considering the Insull scandal and the various other financial messes and capital pyramiding scandals which the Federal Trade Commission has been uncovering at the Washington hearings regarding the power combination's maneuvers during the speculative era.

Big business is accused of many injustices, and the Bell telephone organization has not escaped criticism for various practices, but even its most critical enemy will be surprised at Dr. Splawn's putting it on a par with the demon "power trust," which wears a complete assortment of horns and tail, according to the general Washington conception.

Probably this unexpected hook-up of the Bell and the power combination accounts for the newspaper headlines putting unusual emphasis on the telephone holding companies in the press handling of the Splawn report.

The charge that the A. T. & T. is "more powerful and skilled than any state government with which it has to deal," is another statement submitted to support the idea that a more complete inquiry is necessary to determine just what the federal government should do in the way of regulation.

This assertion will be freely conceded by the state commissions of Michigan, Wisconsin, Indiana, Washington, Oregon and other states that have vainly tried to regulate the parent Bell company in many rate controversies.

* * * *

A significant paragraph in the report uncovers Dr. Splawn's belief that a more exhaustive investigation of the Bell System may prove that long distance telephone rates can be reduced materially.

He refers to the "magnificent plant" of the A. T. & T. Co., its ability to obtain ample capital and then asks: "If 20 cents be a reasonable charge for a service from Washington to Baltimore, may it not be possible to place the call with any exchange in any American city at approximtaely the same cost?"

(*Please turn to page* 41.)

COMING CONVENTIONS

Wisconsin Telephone Association, Park Hotel, Madison, April 24-26.

South Dakota Telephone Association, Mitchell, April 25.

Indiana Telephone Association, Claypool Hotel, Indianapolis, May 9 and 10.

Missouri Telephone Association, Hotel Muehleback, Kansas City, May 16-17.

Pennsylvania State Telephone & Traffic Association, Penn-Harris Hotel, Harrisburg, May 18 and 19.

Up-State Telephone Association of New York, Syracuse, May 23 and 24.

XUM

Solderless Connectors; Telephone Lines

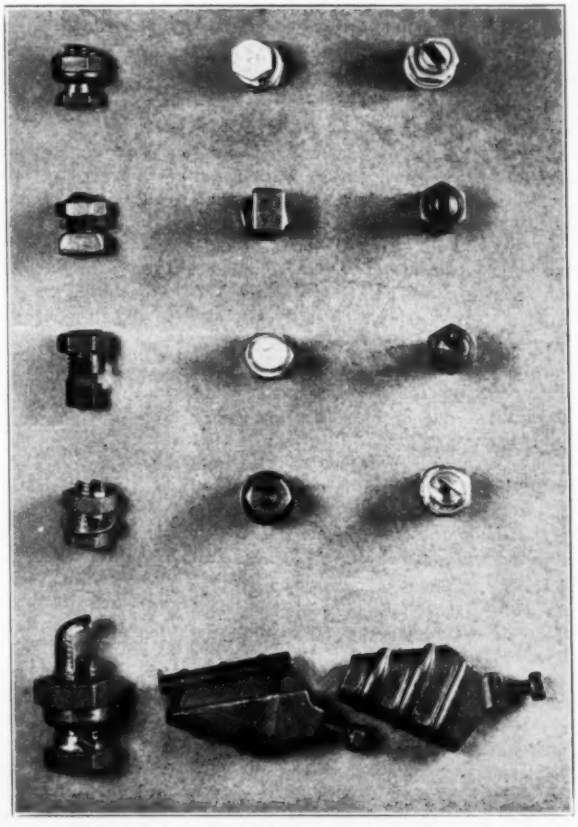
Various Uses of Solderless Connectors in Telephone Work—Features of New and Modern Designs of Connectors—Economy of Connectors in Certain Situations—Increasing Use as Advantages of Modern Types Are Learned—Part I

By Ray Blain

The connecting of two or more wires in a manner that will provide a joint, strong mechanically and sound electrically, is one of the most important things in telephony. These joints must be easily, quickly and economically made to meet present-day requirements. They must also be of uniform quality, for a variation in telephone joints can never be tolerated.

Formerly it was considered necessary to solder all joints, whether in the switchboard multiple or out in the center of an iron wire span on an aerial line. Solder is without a doubt one of the greatest things in the telephone world, and it is doubtful that its importance will ever grow less. When a joint should be soldered, there is no substitute and probably never will be.

There are places, however, where soldering is most difficult and, if attempted, actual harm may result. Such places are where twisted pair taps are taken off of open wire, or where jumpers connect to open wire on a dead-end pole. On work of this nature the solderless connector proves its worth, for it is easily and quickly installed, makes a most satisfactory and uniform connection and does not weaken the line wire in the slightest.



Side and End Views of Some Modern Connectors.

When making party-line taps on twisted pair or parallel drop wire, the solderless connector will be found highly desirable. No damage is done to the rubber insulation or the outer braid on drop wire when solderless connectors are used.

Design Features.

Solderless connectors for telephone work have been built along a number of different lines. The U-bolt type, sometimes referred to as slotted-bolt, split-bolt and split-screw, has persisted. In general it has supplanted most other types because it offers a convenient and effective means of forcing the wires in contact against each other.

Another connector, which retains the advantages of the slotted-bolt type, has about 48 per cent of the bolt cut away and the nut carries an angular looking jaw which clamps the wires against a similar jaw on the bolt head in a vice-like grip. The nut which carries the locking jaw is bumped on the bolt so that it cannot come off as it is not necessary to remove it, for sufficient space is provided for wires to enter from the side.

A connector, designed especially for use on toll lines, consists principally of two large wing nuts which fasten together with a male and female thread. One wing nut has a hole drilled through the center and the other has provisions made to solder a wire to it. The wire is then run through the hole and soldered to a tinned slug. The wing nuts are screwed together and the tension is placed on the point of contact inside and out of the weather. These connectors have the additional advantage in that they may be opened for test frequently and still maintain a good solid connection.

Still another design new to the telephone field, although used extensively by telegraph, signal and power companies, is V-shaped, with a space along one side for the line wire and along the other for the tap wire or jumper. A V-shaped wedge is forced in between the two wires by a screw which presses them out against the side of the clamp to make the connection.

Present-day manufacturers are making every effort to produce solderless connectors for telephone work, that will be found entirely satisfactory and will give years of faithful service without trouble. A few of the design features will be mentioned to indicate that the modern solderless connector is really a superior article. The evolution of the telephone connector has been somewhat as follows:

The original slotted-bolt type introduced some 30 years ago consisted of merely a slotted bolt, a washer or two and a nut. Occasional failures of these connectors to maintain a good joint for a long period of time revealed that the bolts tended to collapse under the tightening of the nut, which resulted in stripped threads.

Then the ever-enterprising lineman made it a habit to bend a piece of the bridging wire around into the portion of the slot within the nut, and in this way limited this collapsing. Manufacturers, always eager to improve their products, provided a washer with a central heavy portion to limit this collapsing. Later this washer was made to be carried by the nut, thus eliminating the need for handling extra pieces.

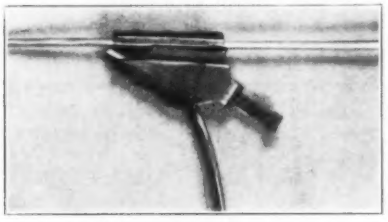
Modern methods have further improved these connectors in many ways. The heads are usually hexagonal, although some are rectangular shaped. The heads are also designed with a view to giving them greater torsional strength. The nuts of some connectors are reversible so that they may be started on from either side. A pilot in the nut helps start it on straight and makes the crossing of threads practically impossible. Slot edges are rounded to prevent wire nicks.

Efficiency of thread fit and reduced dragging friction of the contactor against the slot, permit extremely high pressure on conductors and protects them against increased electrical resistance due to corrosion. Head and nut sizes are generally such that they permit the use of regular socket

XUM

wrenches carried by the lineman. If they do not happen to fit his wrenches, then pliers may be satisfactorily used.

One split-bolt connector of a new design has one leg extended and bent so that the nut cannot be removed. This extended



Modern Wedge Type Connector in Use.

leg also acts as a pilot and it is practically impossible to cross threads. When the nut is placed at the extreme end of the extended leg, there is ample space provided for sliding the line wire into the bolt slot.

Some make use of a full round washer which supports the sides of the slotted bolts. This washer also gives an equalized bearing surface on the nut and eliminates spot loading. When the legs of the slotted bolt are supported, much greater pressure can be exerted between the two conductors, which is another way of saying that better conductivity is obtained. The tendency to split the threads of the bolt, or of the nut to jump off, is entirely eliminated because the assembly is, in effect, a slotted bolt on which the nut is screwed.

Power companies generally use the slotted bolt connector, with a single washer or contactor when the center pilot assumes the purpose of the washer. For some reason many telephone companies insist on two washers, and manufacturers will furnish them when desired.

It is not believed that any special advantage is gained from the use of two washers on a connector unless they are used to separate dissimilar metals, of which more will be said later. Unless two washers are desired for this purpose, they are considered a disadvantage as there is introduced an additional energy transfer between the conductors.

Connectors which are cut on a screw-machine are made in two types: those with hexagon head of somewhat greater cross-flats dimension than the outside diameter of the thread, and those with the small head where these two dimensions are practically identical.

The "pressure bar," or member which slides in the slot, is manufactured by a wide variety of methods: as a forging with or without locking tabs; as a washer, as an extruded section; or as a pair of strips riveted together. The nuts are cut from hexagonal rod, some being tapped with a special 85 per cent thread.

These features indicate that vast improvements have been made in solderless connectors during the past few years and that at the present time there is no need for any telephone company to make use of inferior or difficult means of wire connecting. Although modern connectors may differ somewhat, if properly installed, all or any of them will be found entirely satisfactory.

Modern solderless connectors may be likened to modern automobiles: all are good if properly used, although some people prefer one make to another, for they consider that it meets their requirements better. There is a connector for every telephone requirement, no matter how exacting, and any company will do well to investigate their merits.

Solderless connectors are usually constructed of bronze, brass or copper, and manufacturers will generally supply them of either material desired.

At the present time most connectors are made of hardware bronze, 85, 90 or 97 per cent copper. Commercial brass (60 per cent copper) when worked cold, is sometimes under suspicion for outside construction because it is subject to season cracking or crystallization. However, millions of brass connectors are in service in telephone plants, which have given satisfactory service for a period of years.

It is not believed that brass connectors will season crack under the strain necessary and usually applied in telephone work. Brass connectors used by power companies, especially north of the Mason and Dixon line, have caused trouble within a few years due to season cracking. This is due to the fact that power linemen carry large wrenches and pliers and place much greater strain on connectors than do telephone linemen with their small socket wrenches or pliers.

For this reason power companies insist on bronze connectors as they will not season crack when exposed to the elements under tension. When pure copper is used for connectors, it is hardened so that the tensile strength of hard-drawn copper is obtained. Various high copper alloys are used, combining excellent strength and corrosive resistance with good conductivity.

Some claim that another important factor in the production of connectors is that the original screw should be turned out of bar stock and should not be headed. This heading operation, it is claimed, has a tendency to harden the part headed and, as a result, the head will crack off after it has been under tension and exposed to the elements for any length of time. It is also true, however, that the headed screw has been used on telephone connectors with good succeess.

Although opinions may differ as to the correct material to use in solderless connectors, one may rest assured that any connector purchased from a reliable concern will be satisfactory for use on telephone work in his locality. The reliable manufacturer has his reputation at stake and will not sell an article that will cause trouble, for should he do so the life of his company would be shorter than that of a bootlegger since the passing of the 21st amendment.

As previously stated, all connectors offered by honest manufacturers will be found entirely satisfactory. Hence in making selection choose the one considered best to meet your particular requirements.

Electrical Resistance of Joints.

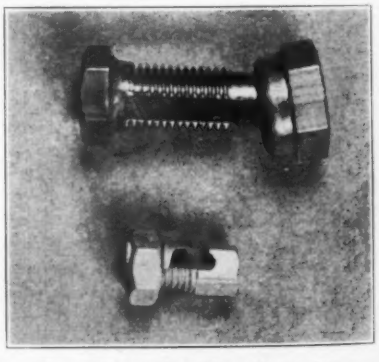
It is important that joints made with solderless connectors have a resistance less than that of a length of wire equal to the length of overlap of the wires connected. Various tests have indicated that at the wrench torque generally used in the field (about 15 to 30 inch-pounds), the resistance of the joint made with any of a large group of solderless connectors is well below that of an equal length of wire.

It was noted also that when approximately 15 inch-pounds of wrench torque have been applied to the nut, further tightening resulted in no decrease in resistance. A group of connections made with solderless connectors was also submitted to a weathering test, which is the equivalent of two years' exposure in the worst industrial atmosphere.

The drop of potential of a typical joint was 32.5 microhms before weathering, and 43.4 microhms after weathering. The connection was then heated to red heat for a period of four hours and allowed to cool, after which the resistance measured 44.6 microhms.

These tests should prove conclusively that solderless connectors can be relied upon to maintain low resistance and meet the most exacting requirements of the telephone industry. Joints, whose resistance varies under different weather conditions, can cause no end of transmission trouble on telephone lines.

If the truth of this statement is doubted, just ask any old telephone man whether he ever had trouble with rosin joints. Joints



Two Modern One-Piece Connectors.

that cause intermittent trouble are always the most difficult to locate. The modern solderless connectors, it is believed, if properly installed, will eliminate this annoying trouble for all time.

(To be concluded next week)

Service Dependability and Guy Anchors

Limitations of Rules for Installing Guy Anchors—Cost Studies of Anchoring Problems Indicate Way to True Saving—Anchoring Suggestions for Controlling Inconstant Factors of Workmanship Quality and Soil Characteristics

By T. De Witt Talmage

One of the interesting results of the present industrial stress is the more general realization that all industries are not constituted fundamentally alike. We have seen some businesses abandon the field of action, crawl into the cyclone cellar, and inaugurate a period of watchful waiting. To them, depression time means marking time.

The telephone industry, for obvious reasons, could not follow such a course of action; instead, it had to "carry on" in spite of station shrinkage and revenue slumps. Not only must current maintenance work be carried steadily on to combat the continuous depreciation and wearing away of the property, but much extra work and expense have been caused by the necessity of moving outside plant to conform with new right-of-way lines resulting from the rapid extension of state highways, state-aid roads, and similar public works programs.

Because of the increasing attention being given to the reduction of line failures and service interruptions, as one of the first essentials to good telephone service, special pains are being taken to install dependable anchorages in many of these new construction jobs. Perhaps a few short service interruptions at a time when they least affect the subscriber need not be considered serious; but if many long interruptions occur at times when interruptions are most serious, they are provoking to the public, extremely annoying, and may occasion considerable financial loss.

The grouping of telephone companies into larger operating units has given impetus to the systematizing of much telephone plant construction. In every telephone plant there are portions which are similar to other portions, and a large part of the construction work required in one locality is the same type as that required in other localities. This condition makes it feasible and desirable to have specific instructions available for the use of the plant forces in installing a large part of the telephone plant.

These uniform methods educate the construction forces as to the details of installing the various parts of the plant and standardizing their work. The employe is then able to perform the same class of work in any part of the company's system, or in other locations where the same specifications are standard.

One of the jobs for which it is more difficult to lay down hard-and-fast rules to guide workmen is that of anchoring and guying telephone lines. Many anchoring installations have their own individual requirements which must be met, and for that reason many cases must be handled on their own merits. To properly locate the anchorages in relation to the strain to be held, sometimes requires quite a bit of ingenuity and a good understanding of construction values.

Furthermore, just as every farmer knows that soils differ in their productive power, so does every construction man know that soils differ radically in their ability to withstand strains of guy anchorages.

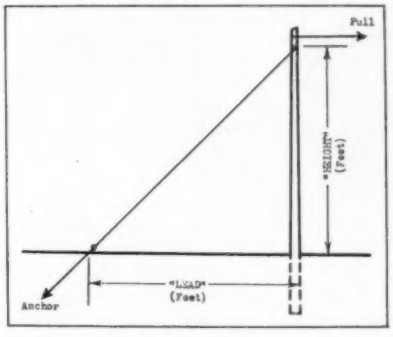


Fig. 1. Stronger Anchorages are Required with Attendant Higher Cost to Hold Increased Strain Resulting From a Decrease of the Ratio of "Lead" to "Height."

There are many variable factors which enter into the anchoring problem. For instance, identical soil composition does not necessarily mean that identical anchors can be used to hold the same strain, because one location may be well drained while another spot may retain water during certain seasons. The moisture content of the earth affects its cohesiveness. This in turn influences the holding power of the soil, which changes the requirements of the anchor that will work to best advantage.

In relocating pole lines along state bond issue highways, in Illinois at least, the anchoring problem is further complicated by the strict regulations of the highway department regarding the location of guy anchors so as not to interfere or inconvenience the highway maintenance people in mowing vegetation. Consequently, many anchors must be located closer to the base of the pole than would otherwise be the case.

This means that stronger anchorages are required, with their attendant higher cost, to hold the increased strain resulting from the smaller ratio of $\frac{\text{"Lead"}}{\text{"Height"}}$.

For example, the strain of an anchor is approximately doubled when the ratio of "Lead" over "Height" is reduced from 1 to ⅓. That is, if an anchor rod enters the ground at a point 18 feet from the base of a pole and the point of attachment of the guy on the pole is 18 feet above the ground, Fig. 1, the ratio of "Lead" over "Height" is 18 over 18 or 1.

If the anchor is moved closer to the same pole so that the anchor rod enters the ground only 6 feet from the base of the pole, the ratio of "Lead" over "Height" is 6 over 18 or ⅓. In this case the resulting strain on the anchor is about twice as great as in the first position.

Where conditions permit the choice of several methods or types of anchorages, cost studies should be made involving an analysis and study of not only the first cost of the different types of construction to be used for the same purpose, but also the "annual charges" or costs of ownership and upkeep. The latter costs, in fact, are usually the determining factors, since a plant of higher first cost may save more in depreciation and maintenance than its excess cost in interest and taxes. Any saving in original investment which results in excessively high maintenance charges is certainly not good judgment.

When overhauling and rehabilitating leads, all corner poles without guys should be closely inspected and guys added to them before they have decayed to such an extent that there is danger of them giving or breaking off. Slack guys should be pulled to the proper tension. In pulling guys care should be taken not to get the line wire too tight or to "rake" the corner pole too much. When pulling slack guys, watch the anchor; if it gives, it should be replaced.

With good corners as a foundation it is an easy matter to put the rest of the line in condition for good service. Before pulling slack out of line wire or disturbing it in any way, it is well to go over the line, section by section, and test for high-resistance joints.

The reason for testing joints before pulling slack in the line wires is that bad joints in slack wires are likely to become good when the wire is pulled tight; and, of course, they will gradually go bad again. If these joints are located and cut out before pulling slack or disturbing the wire in any manner, a good working line is generally assured.

One of the desirable requirements for open-wire joints and splices is that they be kept under strain. Excessive sag should be removed, therefore, to minimize the possibility of the development of high-resist-

ance joints and cutouts. In general, slack should not be pulled unless the wires are very slack or quite uneven.

If the wires are reasonably level, there is little chance for them to swing together, even when they are more slack than specifications require. In many cases excessive slack can be removed by tightening guys; and this method should be given consideration before cutting of the wire is resorted to. Where the wire, especially galvanized iron wire, is found to be too slack, the condition generally results from some guy or brace giving away, and the slack can be taken out by restoring conditions to normal.

Due to the trend toward the use of poles of smaller diameter combined with heavier loads and the necessity of locating anchors close to the poles in many cases, it is desirable under certain conditions to take steps to prevent the pole from sinking into the ground.

This can be done by setting a foundation under the pole formed of two planks, treated with a wood preservative, two inches thick by 12 inches wide and about two or three feet long, set at right angles. This method serves to distribute the weight over a greater area and reduces the pressure per unit of surface.

Lack of Information on Anchoring.

In recent years the efficacy of anchor installations has shown some improvement, due to refinements made in the anchors themselves as well as more thought and care being used in the installation process. However, there is still a lack of information in some quarters, and some misinformation and unwarranted prejudice in other quarters, regarding methods of making dependable, economical anchorages.

Perhaps much of the confusion which exists could be cleared up at the outset by stating that no one type or size of anchor is equally satisfactory and economical for all soil and load conditions. Therefore, the anchoring problem resolves itself into choosing the general type of anchor best suited for the soil conditions encountered, and then determining the correct size of this partieular type of anchor to hold the load to be applied.

The ultimate strength of the anchorage should be greater than the actual strain applied, the proper anchor strength being determined by multiplying the estimated pull in pounds under the worst weather conditions by the factor of safety which experience has shown to be desirable to use. That is, when we speak of the factor of safety of an anchor, it is sometimes understood that the anchor will not creep or fail until the actual loading has become equal to the design loading multiplied by the factor of safety.

As a result of attempts to solve anchoring problems by using material which just happened to be at hand, there have been a variety of make-shift anchors employed. Concrete has been used in many ways. Some telephone companies have tried making precast concrete anchors in the shape of cylinders and cones. Some have cast concrete anchors in place in various shapes. However, the cost of making special concrete anchors on a small scale is usually greater than the price of standard anchors.

Simplest Patented Anchor.

The simplest patented anchor which is in general use in the telephone field is the cone-type anchor. This anchor is made by several different manufacturers in slightly different forms; but all cone-type anchors act on the principle of the inverted wedge, the conical point being projected upward in the direction of the pole and the pull. The greater the strain on the guy wire, the tighter in the ground the anchor becomes wedged.

The cone-type anchor is installed with crushed stone or rock (about 1½ to 2 inches in diameter), hard brick, or coarse gravel tamped in directly on top of the metal cone. This material is compressed compactly against the sides of the hole with every pull of the guy wire, because the conical shape of the anchor forces the tamped rock *outward* in all directions as well as upward. Naturally, this type of anchor must be used in locations where the sides of the hole remain constant in their degree of firmness throughout the year.

In soil that is moist or loose, it has been the practice of some companies to increase the holding power of the log-type anchor by splitting the logs in two and setting them with the flat side upward. This split-log anchor is sometimes called a "slug" anchor to differentiate it from the whole-log anchor. Under the same earth conditions other companies have not gone to the trouble of splitting logs but merely flattended the tops somewhat by hewing.

Slug or Log Anchors.

The term "slug" anchor is used rather loosely in describing anchorages. Some telephone men use the term "slug" interchangeably with the word "log." Others have used the term "slug anchor" with slightly different shades of meaning.

For example, one engineer has used the term in his appraisal work to designate the case where a log anchor is used without an anchor rod, the guy being wrapped directly around the log. This is not, of course, a standard type of construction and is not recommended, but it is a type which is occasionally found in the smaller plants.

Another engineer uses the term "slug anchor" to designate the case where any log anchor shorter than seven feet is used for an anchorage. In some specifications the word "slug" does not appear at all. Probably its use should be restricted to describing odd-shaped anchors for which there is not in general use a more accurate descriptive term.

In Illinois some construction men have made use of the county soil survey maps published by the agriculture experiment station of the state university, to aid them in studying the characteristics of the soil in which poles and anchors are placed. These surveys are helpful in some types of problems because the reports are made on the make-up of the earth for a depth of 40 inches. These soil invoices are based on samplings representing three different strata, and they are useful in indicating the presence of gravel and stone underneath the top soil along routes which telephone lines follow.

Another type of anchor that can be used in a variety of soil conditions is the plate-type anchor. One style of the plate anchor is a one-piece metal plate that is used with a one-piece anchor rod. Another style has a mechanical trap in the center of the plate which catches the special driving point screwed on a standard anchor rod.

All styles of plate anchors are installed by boring a hole so that the plate can be set at 90 degrees to the line of strain. The rod is driven in line with the point of attachment of the guy on the pole until the rod point projects into the hole.

If the point of the rod is off center so that the plate itself cannot be properly placed, the end of the anchor rod in the hole can sometimes be bent with the tamping bar, and the rod then turned to bring the point in the center of the hole. The plate is hooked on the rod by means of a plate-holding tool.

Expanding Type of Anchor.

One of the more common types of patented anchors, which is quite popular in the telephone field, is the expanding anchor. The greatest holding power is obtained from expanding anchors when the hole in which they are placed is the same size as the diameter of the anchor in the closed position. Ordinarily, the variations of the bored hole give sufficient clearance so that the anchor may be inserted without binding or wedging.

Do not put an expanding anchor into a hole larger than necessary just because the right sized auger is not available. An earth auger which can be adjusted for several sized holes and which has a telescopic handle, will be found quite useful around any exchange. A good auger will save its price many times over in labor costs.

The anchor hole is bored in line with the guy. While boring the hole, a convenient guide for lining up the direction of the hole is to stretch a hand line temporarily in the position the guy will occupy. If the hole happens to be bored out of line, a small trench should be dug before the anchor is expanded so as to bring the anchor rod in line with the guy. In locations where holes cannot be bored, they may be dug with digging tools. They should be as small in diameter as these tools will permit and still allow the anchor to slide down the hole easily.

In order to illustrate the method in which expanding anchors are set, the simplest ex-

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panding anchor in general use will be taken for an example. Expanding anchors are made by a number of manufacturers so that they expand in two ways, three ways, four ways, and five ways. Of the two-way expanding anchors, there is one type that consists of but three pieces besides the anchor rod, and two of these pieces are identical. This particular anchor is called the 4-in-1 expansion anchor because it combines in its design certain features of the cone anchor, the plate anchor, the metal slug anchor, and the expanding anchor.

The 4-in-1 expansion anchor is assembled on the anchor rod by first hinging the two blades together. The nut is removed from the rod and the blades are slipped on. The round base or disk is then placed on the rod with the flat side toward the blades. The nut is then screwed tightly on the rod, just as far back as it will go. The nut of the rod fits into a socket in the anchor disk, which permits the rod to be recovered in case the anchor is ever abandoned, providing the threads are undamaged and not unduly rusted. The assembled anchor then appears as shown in the upper left-hand corner of Fig. 2.

To facilitate a tighter assembly there is a small hole in the end of each blade which can be used for wiring them to the base plate with small-gauged wire. This fine wire is readily broken on the first stroke of the expanding bar.

The anchor is placed in the hole so that the tapered ends of the two blades are horizontal and then shoved down the hole. Best installation practice requires that the anchor blades be expanded in the horizontal position so that they will pull against the same strata of earth at the bottom of the hole. This is desirable because if the blades are set in a vertical position, the earth at the top of the anchor is not as solid as that at the bottom.

Another advantage of the nut socket in the anchor disk is that in case the properly-assembled anchor twists somewhat out of position in placing it down the hole, this feature makes it possible to rotate the complete anchor in the hole so that the blades may be placed in the horizontal position preparatory to expanding.

The principle upon which the 4-in-1 anchor expands is quite simple: a few blows against the top of the blades pushes them downward and outward until they are completely expanded with nearly two-thirds of the total area of the anchor in solid, undisturbed earth as shown in the larger of the two illustrations in Fig. 2. The contour of the blades directs a stress outward as well as upward when expanded.

For expanding the blades, many companies use a combination expanding bar and tamping bar with a wood handle and a special iron shoe. This tool is locked on the anchor rod and will not jump off when the bar is pounded down on the blades. The iron shoe on the bar strikes a square blow and insures complete expansion of the blades into the earth six inches from the edge of the hole in the case of the eight-inch anchor. In the case of the 10-inch anchor, each blade is embedded in earth 7½ inches from the edge of the hole.

The experienced workman will readily recognize the sound made by the expanding tool when the blades are expanded to their final position and locked over the edge of the base plate. A simple and positive way to check the complete expansion of the blades is by gauging the marks on the handle of the expanding bar.

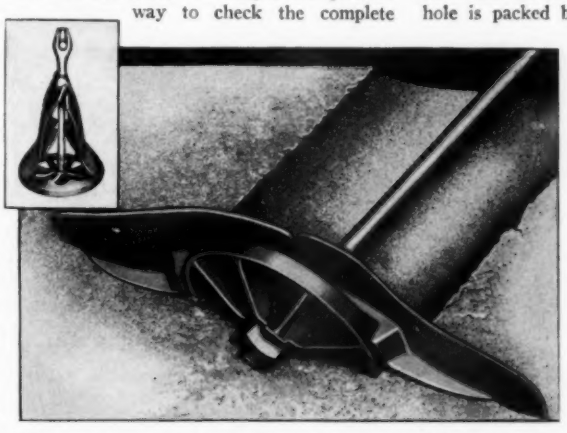

Fig. 2. An Expansion Type Anchor in the Closed Position (Upper Left-Hand Figure) and in the Expanded Position. Note Contour of the Blades Directs the Stress Outward as Well as Upward When in the Expanded Position.

The measured distance through which the top of the blades moves to reach the expanded position is marked off on the expanding bar handle with a carpenter's pencil. This is about eight inches in the case of the eight-inch expansion anchor shown in Fig. 2 and about 9½ inches in case of the 10-inch anchor of the same make.

A third reference mark is made on the anchor rod exactly opposite the *bottom* mark on the bar handle. The anchor is then hit with the expanding bar. When the *top* mark on the expanding bar handle is directly opposite the reference mark on the anchor rod, the anchor is fully expanded.

A makeshift expanding tool, useful in emergencies, is a length of ordinary iron pipe which can be slipped over the anchor rod and used to expand the anchor blades. The pipe, of course, is somewhat more difficult to use unless a very large pipe is selected, because the necessary weight is not available. A standard nine-foot expanding bar weighs 20 pounds, and a 12-foot bar weighs 26 pounds. Furthermore, the expanding bar handle is shaped to fit the hand while a large pipe is rather awkward to use.

The expanding bar is removed and the anchor rod is placed in line with the point of attachment of the guy on the pole. In this position the top of the eye of the rod should not be less than six inches and not more than 12 inches above the surface of the ground measured in line with the rod. The earth is backfilled slowly and each layer of dirt is thoroughly tamped until the tamping bar makes a dull, solid sound as the earth is struck.

Too much stress cannot be laid on proper tamping. A carelessly-installed guy anchor never improved the stability of any line. In general, the tamping should be so well done that all dirt taken out of the anchor hole is packed back into the hole. After all dirt is firmly tamped back on top of the expanded anchor, pile soil around the anchor rod, pack it firmly, and smooth it off in a neat and workmanlike manner. Do not cover the eye of the anchor rod with dirt.

Expanding anchors are made in sizes from about four inches in diameter up to 12 inches in diameter in the closed or unexpanded position. The total area in the expanded position differs widely among the various makes of expanding anchors, even in anchors of the same diameter in the closed position. For example, the eight-inch expanding anchor can be secured having as little as a total of 75 square inches of surface in the expanded position up to as great as 138 square inches of total surface when expanded. One manufacturer alone makes eight-inch anchors having five different areas when expanded.

This condition is mentioned because the erroneous impression prevails in some quarters that all so-called "eight-inch" expanding anchors have the same holding power. Such an idea is incorrect, of course, because the strength of a guy anchorage depends upon the area of the anchor and the mechanical resistance of the earth against which it pulls. All other conditions remaining equal, the anchor with the greater area has greater holding power.

The area of the anchor in undisturbed earth governs to a large extent the holding power of the expanding type anchor. If the area of an eight-inch hole is subtracted from the two examples of eight-inch expanding anchors previously mentioned, we find that one anchor has slightly less than 25 square inches of surface in contact with undisturbed earth while the other has nearly 88 square inches of surface in solid earth, a difference of 63 square inches. Yet both anchors are termed "eight-inch" anchors.

It is evident, therefore, that the diameter of an expanding anchor in the unexpanded position does not reflect its holding power

when it is fully expanded. Likewise, the number of "ways" or blades which expand does not accurately indicate the holding power of an anchor because some two-way expanding anchors have more area in contact with undisturbed earth than some four-way expanding anchors of the same closed diameter.

This condition should be kept in mind when specifying anchors, because ordering expanding anchors at random, either by the size of the hole they are set in or by the number of ways in which they expand, is like ordering an electric motor by physical dimensions instead of horse power.

If a graph is made in which the recommended holding power of the various designs of expanding anchors is plotted against the square inches of anchor surface in actual contact with undisturbed earth, it will be found that for most practical purposes the holding power of expanding type anchors in average soil formations is in direct proportion to the undisturbed earth area.

So if an expanding anchor is being used which has proved satisfactory for a 6,000-pound guy strand, and it is desired to select an anchor which will insure holding a 100 per cent heavier load, the procedure would be to pick out an anchor with an undisturbed earth area 100 per cent greater than the anchor that is being used.

The information regarding the number of square inches of anchor area in undisturbed earth can be secured either from the manufacturers of anchors or by actually measuring the anchor with a planimeter.

Because the cohesiveness of soil is not a constant thing, it is well to provide a good margin of safety in all anchor installations. Just as a factor of safety is used in determining the correct size of guy strand, so should even a larger factor of safety be used to offset the variations in the mechanical strength of the ground due to the ever-changing conditions of most earth formations.

There are some locations where it is economical to use the screw type anchor. In sand and loose gravel or where water is encountered, it is sometimes difficult, if not impossible, to dig a hole in which to place the type of anchors already discussed. The screw anchor can be readily installed under these conditions. Where the sand is wet and has a tendency to shift so that the holding power is quite small, the swamp or marsh type screw anchor can be screwed down to any depth to secure the required holding power, by simply adding pipe lengths.

The smallest screw anchor is four inches in diameter while the largest is represented by the 15-inch swamp-type screw anchor. There are a number of intermediate sizes between these two extremes which can be used for a variety of anchoring purposes.

Screw anchors can be used in tight-packed clay soil or other hard earth formations by boring a three-inch pilot hole, with a special auger, about four feet deep into the ground. The anchor is then screwed beyond the depth of the pilot hole to the full depth of setting permitted by the length of the anchor rod.

Some companies prefer the "pilot rod" type of screw anchor because of its greater ease of installation in the firmer soils. This type of anchor is a special form of the usual screw anchor which has the anchor rod rigidly attached to the helix. The helix in the pilot rod type of screw anchor can slide back and forth on the anchor rod. A special point on the end of the anchor rod that is driven into the ground pulls against

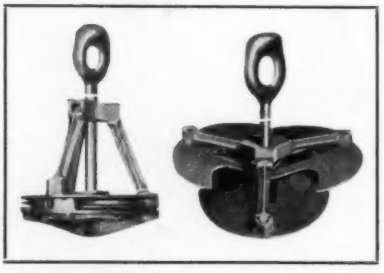

Fig. 3. Another Type of Expansion Anchor. Closed and Open Views, Showing Expansion in Three Directions.

the helix when the helix is screwed down to the end of the anchor rod.

In the installation of the pilot-rod type screw anchor, a way is opened for the helix by starting the hole for about six inches with an earth auger or shovel. The helix and rod are then placed in the hole. The rod is driven two or three feet into the ground in line with the attachment of the guy on the pole. A special maul is used to drive the rod to prevent injury to the galvanizing on the eye of the rod.

By means of a special wrench the helix is screwed down. The helix follows the driven pilot rod and eliminates the side-twisting that is encountered sometimes with the usual type of screw anchor.

Among other types of anchors which are available is the expanding cone anchor, the expanding screw anchor, the drive-and-twist anchor, the harpoon anchor, and the J-H anchor. For anchoring in rock there are several different rock guy anchors which can be used to an advantage.

There are several improvements in guying hardware which will save considerable time in making dependable anchorages. The angle thimble eye bolts do the work of attaching the guys to the poles better and neater than the old method of wrapping the pole with the guy, as well as saving the length of strand necessary to circle the pole. These bolts also eliminate the use of strain plates or guy shims, guy hooks, drive screws, and nails with the accompanying saving in the cost of this material. The installation cost is low, as drilling of a hole through the pole is all that is required.

Another piece of improved hardware which effects quite a saving in installation time on certain jobs is the combination anchor rod, guy clamp, and guy thimble, all in one piece. One type uses a sheave on the snubbing post to prevent abrasion of the galvanizing on the guy strand when the guy is pulled up under strain. Another type has an eye at the end of the clamp for the purpose of attaching blocks for pulling up the guy.

There is also a combination type anchor rod designed to be used with stiff high-strength guy strand where it is not only very difficult but quite costly to make up and clamp the strand to the usual anchor rod and wire rope thimble. The wedge-shaped part of this clamp is designed so that the grip becomes tighter as the pulling strain increases. With this combination heavy-type clamp anchor rod it is possible to secure stiff guy strand in about one-fourth of the time required by the old method.

United Companies in Indiana Have Real "Show-A-Gain" Campaign.

The "Show-A-Gain" Campaign, conducted the first three months of this year by the United Telephone Co., of Indianapolis, Ind., ended with a total of 1,631 solicited sales by employes since January 1 and a net gain of 270 stations in all of the Indiana exchanges of the company, and two exchanges in Ohio.

The Eaton, Ohio, district finished in first place, with the Attica district in second place. Monticello was a close third, with Portland in fourth and La Grange in fifth places.

In the campaign during the last three months of 1933 the total number of sales was 1,217 compared with the 1,631 of the first quarter of this year. The average number of sales per week was 93.6 in the 1933 drive, and 125.5 this year. There was a net loss of 589 in the last quarter of 1933 and a net gain of 270 in the first quarter this year. It was a real "Show-A-Gain" campaign.

Leg Broken; No Doctor; Instructions for Setting Telephoned.

Five hundred miles of telephone circuit carried the voice of Dr. L. L. Crowe from his office at North Bay, Ontario, Canada, to a priest at Moosonee, Ontario's northernmost town, and provided the latter with directions by which he and two assistants succeeded in setting a fractured bone.

Mrs. Elliott Johnston, one of the few white women living permanently in the settlement, broke her leg in a fall. The day before, the town's resident physician had set out by sled and dog-team to visit a distant patient, the journey to consume several days' time. As a result of the telephoned directions Mrs. Johnston's suffering was reduced and she was properly prepared for a fairly comfortable train trip to hospital at North Bay.

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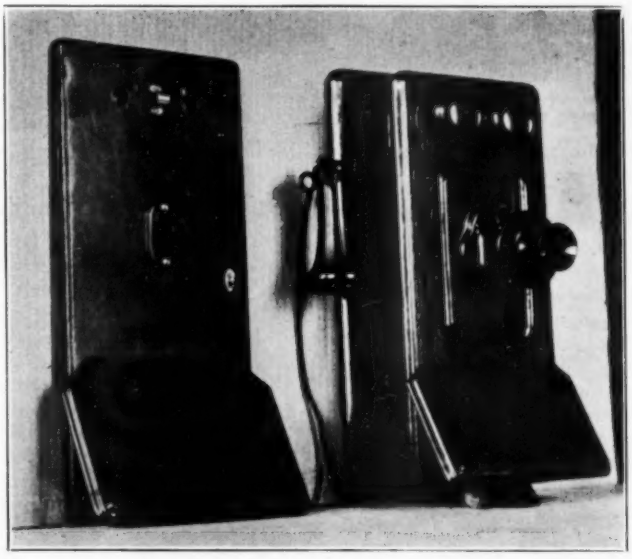
Better Telephones, Better Service

Modern Efficient Telephones Retain Company Subscribers—Junk Obsolete Sets—Take Old Magneto Telephones, Buy New Parts and Remodel, Test and Install—Added Revenue Will Soon Enable the Purchase of New Telephones

By D. H. Townsend,
Churchill County Telephone & Telegraph System, Fallon, Nev.

Spring is here, Mr. Exchange Manager. It is construction time! Time you quit "hollering" about the depression, lost subscribers, inadequate rates, etc., and did a little constructive work in retaining those subscribers who have stuck with you. They deserve a "break." Give them a new set!

I'll admit Bob White is a little behind on his rental. Just the same, take him out a bang-up telephone that *will work* as a telephone should, check over his drop wire, arrester, line connections, etc. Do the same at Bill Brown's and his next door neighbors. Bob will be around in a few days to pay up his bill, so will Brown—"Seeing I've got a new telephone and the service is much improved, guess I'd better pay up."



Front of Refinished Set and a Completely Modernized Set. Both Were Given Three Coats of Varnish After Woodwork Had Been Thoroughly Prepared, Cleaned, and an Oil Stain Applied.

"But," you say, "where am I going to get $20 to give White a new telephone?" You are not, right at present; you simply cannot dig up that amount. However, you can dig a set out of the dust on the storeroom shelf and with but little work and a very few dollars for parts, make White's set.

You haven't time! Rats—just use that time you spend each day trying to talk Pete Smith into keeping his telephone, and the time spent telling so-and-so why you are unable to do this-and-that.

Pete has looked at that obsolete wreck on his wall for 15 years or more. He has bumped his head time and again on that long hat-rack transmitter arm and worn out his lungs trying to make people hear him over it. He has paid enough rental in these many years to buy you several telephones.

I'll bet the electrodes in the transmitter are full of pits, the carbon is "blooey," and the rubber gasket so dry or brittle the diaphragm cannot move. Yes, I'll go you one more—the dry cells are over three years old, if a day. You marked the date on them when you put them in. Sure, your record is out at Pete's house instead of in your office where it belongs.

Why, man, even six new cells will not make that set *talk like a telephone!* Yet you are spending valuable time trying to get Pete to keep it. You, yourself, would not have it in the house—you, a telephone man who knows the average life of a transmitter is around seven years, that there is a shelf life to dry cells, and that a modern transmitter has a far higher efficiency besides carrying a greater range of voice frequencies.

Put that wasted talking energy into real, constructive working energy. If you don't feel you can give Pete a brand new telephone, at least give him a well-finished, neat, modern-appearing telephone that will meet 1934 conditions. *Then watch Pete boost for you.* He will bring you additional subscribers, and the revenue from them will buy you new telephones.

You haven't the time! What, again? Come out of it, man, you have as much time as I. True, we have only 390 common battery and 425 magneto sets, but those magneto sets are scattered over a whole county—1,400 wire miles, plus 120 wire miles of toll line and 25,000 feet of aerial cable; located in a farming community, hard hit by the past depression, not a bank in operation since the failure in 1932.

Sure, we lost stations—but we stopped the loss by action not by talk. Our rural rate is only $1.25 per month. Our sets *were* in no better condition than yours. We had some Western Electric 301's, Kellogg

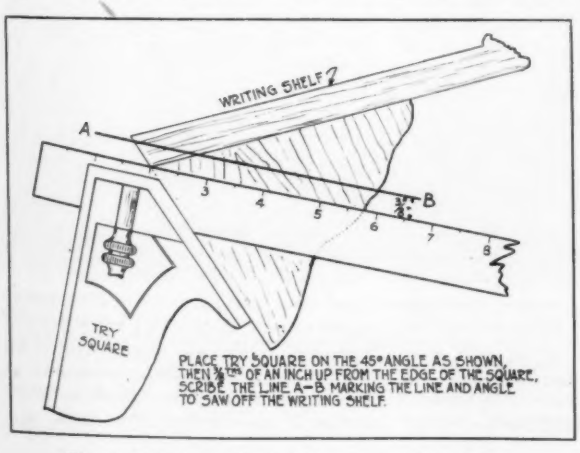

WRITING SHELF
A
B
3
4
5
6
7
8
TRY SQUARE
PLACE TRY SQUARE ON THE 45° ANGLE AS SHOWN, THEN ¼" OF AN INCH UP FROM THE EDGE OF THE SQUARE, SCRIBE THE LINE A–B MARKING THE LINE AND ANGLE TO SAW OFF THE WRITING SHELF.

Fig. 1. Detail for Modernizing the Writing Shelf.

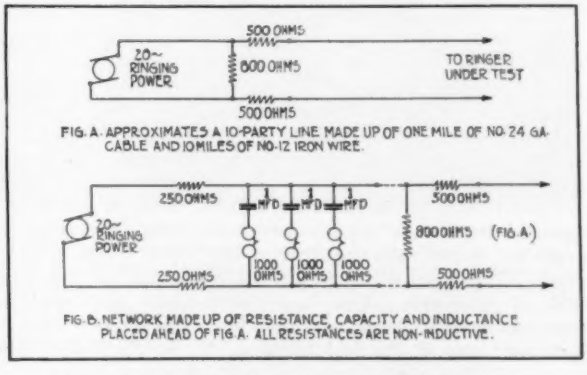

500 OHMS
20~ RINGING POWER
600 OHMS
TO RINGER UNDER TEST
500 OHMS
FIG. A. APPROXIMATES A 10-PARTY LINE MADE UP OF ONE MILE OF NO. 24 GA. CABLE AND 10 MILES OF NO. 12 IRON WIRE.
250 OHMS
1 MFD
1 MFD
1 MFD
500 OHMS
20~ RINGING POWER
1000 OHMS
1000 OHMS
1000 OHMS
8000 OHMS (FIG. A)
250 OHMS
500 OHMS
FIG. B. NETWORK MADE UP OF RESISTANCE, CAPACITY AND INDUCTANCE PLACED AHEAD OF FIG. A. ALL RESISTANCES ARE NON-INDUCTIVE.

Fig. 2. Artificial Line Network for Adjusting Ringers.

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1128's and other makes of obsolete, ancient vintage—*we junked them.*

We found time during 1933 to bring in an even 200 sets, refinish the cabinets, rewire when needed, supply new parts, give them a thorough ringing and talking test, and then put them back in service. We took a line at a time, changing the sets, renewing drop wire, checking connections, and recording the date, type of set, plus other data on the office card record file.

We had little time to talk, but here's one thing: *Results were quickly evidenced.* One subscriber tells another: "They have put in a brand new telephone for me. I've changed my mind about having the service cut off," etc.

Trouble tickets dropped, and dropped fast, not only those due to defective equipment, but also cut-outs, noisy lines and all such items, thus giving us additional time to devote to equipment. You, Mr. Manager, will find the same thing.

Truthfully, if your predecessor, or *you, yourself,* had played square with your subscriber, your exchange or your public service commission, depreciation alone would have removed those obsolete wrecks before the depression hit. However, now that you are stuck with them on your hands, let's get down to business and work them out or over.

You haven't the money to buy all new sets, but you can buy parts; your supplier, like the automobile manufacturer, has a parts department. Buy from him; he has done your engineering work for you gratis for years.

Do not make mongrels of your sets; Ford parts do not work to good advantage in a Dodge. Transmitters and other parts are *dirt cheap now* compared to what future prices will be. Come on, get busy, let's start! Dig that set out of the storeroom dust and get at it.

First: Strip the set, by removing the transmitter arm, ringer, writing-shelf, generator, arrester, switchhook and all other metal parts. If it's a set with "through-the-back" wiring, remove all wire and make up new cabled form.

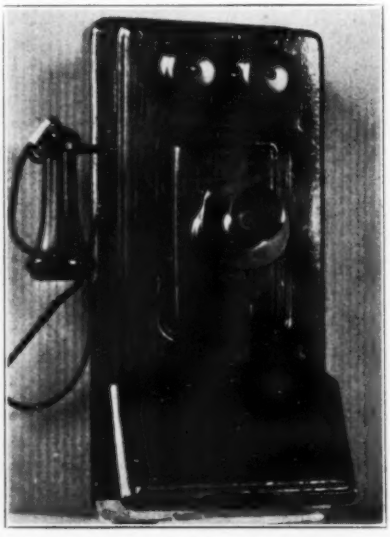
Second: Carefully fill in all transmitter-arm screw holes, arrester holes, etc., with "plastic wood," *following directions on the can.*

Third: When the plastic wood is thoroughly dry, scrape off the old varnish; buy a 30-cent scraper, do not use coarse sandpaper or varnish remover. The scraper removes the old varnish leaving the original filler and a smooth surface, whereas the other two items dig out the filler and scratch the surface.

Fourth: Wipe off the set, using a cloth saturated in "Oronite" or any good non-explosive cleaner, this to remove any grease. Then when dry, stain with Fuller 1954 oil wood-stain. This is a walnut stain but it covers blemishes better than dark oak; also in the final finishing, it turns lighter, giving the set a good, dark-oak appearance.

Do not use a *varnish* stain. The oil stain costs but a few cents more; it penetrates where the so-called varnish stain does not. Again I say: Follow directions on the can, except omit the wood filler; you saved it with the scraper.

Fifth: Saw off the writing-shelf as shown in Fig. 1, scrape and stain it. This



A Modernized 1917 Magneto Set; Cabinet Refinished, Transmitter Arm Changed and Writing Shelf Angle Altered.

gives the same slant as the modern shelf and only two screws will be needed to hold it instead of the four or five originally.

Sixth: During the 24 hours the stain is drying, check over the ringer, generator, induction coil and other parts. TELEPHONY's Engineering Data Sheets in the past few years have given *very thorough instructions* for correctly overhauling and testing these parts; no need of repeating them here.

Seventh: When the stain is dry, sand paper *very lightly,* using the very finest sandpaper obtainable, "triple O" or finer, rubbing with the grain of the wood. Thoroughly wipe off all dust, then varnish with "super valspar," using three coats and following the manufacturer's directions. This is a quick-drying (six-hour) varnish that is tough, has long life and will not turn white. When the final coat is dry, assemble the set, putting on a short transmitter arm, new transmitter, switchhook and other needed parts.

Final: *Test the set,* and test it under more severe conditions than it will meet in actual service. *Be thorough;* make it meet the strictest requirements, for right now you do not know whether it will be placed on your longest line or on a short local line. Artificial line data has appeared in various issues of TELEPHONY. See Fig. 2-A; to this I add another, shown in Fig. 2-B. Any ringer adjusted to work satisfactorily on this network will work on your longest or on your shortest line.

One so adjusted on the test bench required no readjusting when installed 40 some miles away on an 11-party line, made of a mixture of cable, No. 12 iron wire and No. 12 copper wire. If you use condensers in the receiver circuit, make the ringer adjustment with the receiver off the hook, thus testing the condenser and making sure you can ring the subscriber, even though he forgot to hang up.

Now test the transmission. Assume the set is of the "5-bar, 2,500-ohm" type. Remove the artificial line network from the line binding posts and connect an output meter to them (Shallcross 615 or Weston 571. The former has a built-in artificial line. With the Weston it is necessary to bridge a 600-ohm non-inductive resistance across the meter.) Connect two dry-cells in series with a milliammeter (0—250 or 0-300 range) to the set's battery wires.

Remove receiver from switchhook, note milliammeter reading; current climbs to 100, 125 and 150, then starts back down gradually. If it keeps climbing, you have a battery-eating transmitter; if it drops back in short, jerky movements, you have a frying or burning transmitter; and if it goes out in service, a noisy telephone—your operator reports: "Line is noisy only when a conversation is on."

Hold receiver against the transmitter. If all parts are OK, battery properly poled—i. e., negative to transmitter, positive to induction coil—and receiver poled, the output meter needle will swing up to three volts (meter set for six-volt scale) and will remain there as long as the receiver is held against the transmitter—at the same time the milliammeter needle will drop to 40 or 50 milliamperes.

Reject any set showing an output of less than 2.7 volts. If you do not get the output, test the transmitter circuit by speaking, in a normal tone of voice, into the transmitter. The word "hello" will peak close to 1.5 volts on the output meter and the milliammeter needle will follow each voice wave. Speak "Three—six-eight" noting carefully how the milliammeter needle follows each fluctuation of the voice.

When the transmitter circuit tests OK, check over the receiver; perhaps the diaphragm is not properly seated, too far or too close to the pole pieces. Try again for output, reversing the receiver cord connections if necessary. Keep at it until you get the desired reading; it will be there if your parts are OK.

You will learn a lot in these tests. Some think they can judge by the oscillation squeal alone. No two ears are alike; you may have exceedingly keen hearing or be as deaf as I am. This also applies to your subscribers. The visual or meter method is non-varying. You know each

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set is meeting a fixed standard and will satisfy the most critical subscriber.

Now test the generator: switch the output meter to the 150-volt scale, turn crank, note reading, 50 to 60 volts or better.

A telephone showing these readings on two dry cells will meet your local, rural or long distance ringing and transmission requirements. However, for those who insist they must use three cells the oscillation test will peak 4.5 to 5.0 volts, and "hello" above two volts. The current readings will be much higher; the side tone a heap more. But why use three cells when two will do the work? And two will do the work if you have a modern, efficient transmitter plus carefully-overhauled parts and a reliable make of batteries.

Try the foregoing tests on that obsolete wreck out at Pete Smith's before you start overhauling it. Put on six fresh cells and scream at the top of your voice. What! No output? No, the meter is not on the blink! It's simply that the old wreck is about as efficient as a 1910 Model T Ford which never had a valve grind. Now, you see why Pete wanted that telephone removed.

When your revamped set goes in service, record it in your office; you will then know when to change batteries. Then. when you do go out to change them, take your meters along and *service the set;* do not just change batteries and run.

Take ten minutes to blow the dust out of the ringer, wipe off the cabinet, tighten and oil the generator, clean the mouthpiece, thus keeping your subscriber "sold" on the set and your service by action—not talk. The set is worth more to you on the subscriber's wall than on the storeroom shelf.

It takes a little effort, some "elbow grease" and not much cash to get started. You accomplish more by action than by talk. Results of better telephones and better service are quickly evidenced in more revenues from added subscribers—the added revenues will enable you to buy the new, modern sets you did not have the money for a short time ago. Buy new sets, though, right now if you can; if not, buy new parts from the manufacturer. Do it now as prices are advancing daily.

Kansas Urges Strong Selling Efforts

Annual Convention of Kansas Telephone Association Is "Short and Sweet"; Close Schedule Maintained for Interesting Meeting—Timely Talks Encourage Operating Men to Get Out and Sell Service—Day of Golf Precedes Convention

By Dan Hughes,
The United Telephone Co., Abilene, Kans.

The 34th annual convention of the Kansas Telephone Association was held April 12-13 in Hotel Kansan, Topeka, and registration was particularly good this year with 200 in attendance. About 60 arrived in Topeka a day early and 35 men participated in a golf tournament at the Prospect Hills course.

A real Kansas dust storm was at its height all day and the hardy golfers had difficulty in even walking on the course. Naturally, few scores were in the championship class. Telephone training came to their assistance, however, and every man finished his round and turned in his card. Telephone men never let a little storm stop their work or play.

The qualifying round of nine holes was played in the morning and 18 holes handicap medal play in the afternoon. The low gross score was 84 turned in by Emmett Swanson, Automatic Electric Co., Chicago. Low net was 71 by Sam Harris, Southwestern Bell Telephone Co., Kansas city, Mo.

Blind bogey prizes were won by Endsley Jones, Western Telephone Corp., Kingfisher, Okla., for low, and by J. B. Haley, of the same company, Kansas City, Kans., for high score. High gross score of the day was shot by C. H. Sim, Automatic Electric Co., Kansas City, Mo., with 117. Mr. Sim mentioned that he was sel-

Some Golfers Who Braved High Wind and a Real Prairie Dust Storm to Compete in the Kansas Pre-convention Tournament Over the Prospect Hills Course in Topeka on April 11. Left to right: B. H. Smith, United Telephone Co., Abilene; C. C. Deering, secretary United States Independent Telephone Association, Des Moines, Iowa; F. F. Holmgren, Southwestern Bell Telephone Co., Kansas City, Mo.; H. A. ("Jack") White, Automatic Electric Co., Kansas City, Mo.; Clyde Tucker, Pleasanton Telephone Co., Pleasanton, Kans.; A. J. Roberts, The United Telephone & Electric Co., Kansas City, Mo.; Art Preble, Stromberg-Carlson Telephone Mfg. Co., Kansas City, Mo.; Chester Ruth, Cook Electric Co., Chicago; V. E. Code, Kansas Telephone Co., Topeka; and "Herb" Couch, secretary Kansas Telephone Association, Topeka.

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dom on the course, but that it looked like nice fairway from a distance.

Prizes were contributed by George Rodormer, Reliable Electric Co., Chicago; R. F. Burfiend, Automatic Electric Sales Co., Chicago; Jack White, American Automatic Sales Co., Kansas City, Mo.; E. F. Schulz, National Carbon Co., Chicago; and the Prospect Hills Club.

Sewell Black, Topeka; Endsley Jones, Kingfisher, Okla.; J. B. Haley, and F. M. Browne, Kansas City, Kan., formed a foursome during the afternoon. Sewell Black lost his ball in the dust storm and the foursome stayed out until he found it. Late in the afternoon the ball was located buried in the fine dirt. The rest of the golfers had sent out a searching party for the missing foursome, but it was almost dark before they could be found on the course.

A consolation prize was given by the association to all other entrants in the tournament in consideration of their heroic determination to brave one of the worst dust storms of the year in completing the convention tournament.

Samuel Tucker, Pleasanton, president of the association, was off on his honeymoon at the time the convention met. Fred Coulson, Abilene, executive vice-president of the Kansas Telephone Association and secretary of the United Telephone Co., presided at all of the sessions. Promptly at 10:00 a. m. Thursday, April 12, the first day's business was begun.

Warren S. Miller, Topeka, general manager, Southwestern Bell Telephone Co.,

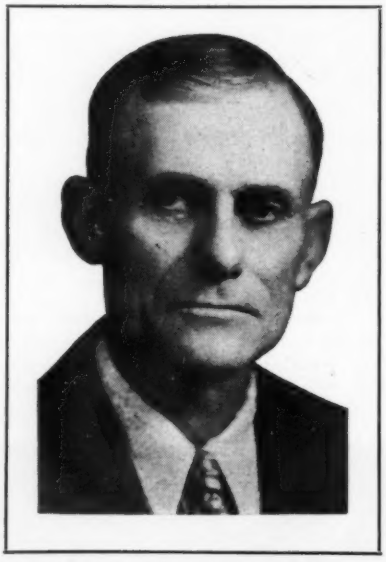
Fred Coulson of Abilene, Executive Vice-President of the Kansas Telephone Association, Presided at the Convention Sessions.

welcomed the visitors to the city. Mr. Miller struck the keynote of the convention when he reported that his company has shown a gain in stations each month of 1934. This condition is general as 80 per cent of the exchanges are gaining. Long distance calls also show an increase over the corresponding period of 1933.

After Mr. Miller's address, committees were appointed. Herb Couch, Topeka, secretary of the association, gave both his own and the treasurer's report.

Much assistance has been given to member companies during the past year; good district meetings were held; and close contact is being maintained with the national association to keep abreast with developments brought about by the NRA and other steps contemplated by the federal administration. The financial condition of the association is good and the year was closed with a balanced budget.

The annual election was held and these three directors to serve three-year terms were elected: J. B. Haley, Western Telephone Corp., Kansas City, Kans.; Walter Pedigo, Southwest Telephone Co., Pratt; Foster Lamming, Suburban Telephone Co.,



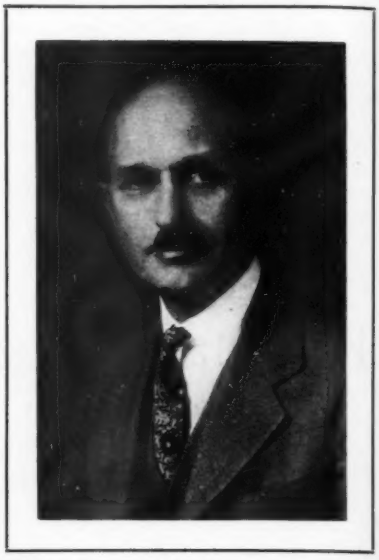
Samuel Tucker, Pleasanton, President of the Kansas Telephone Association, was Re-elected for Another Term.

Tonganoxie. Fred Cross, Wilson Telephone Co., Wilson, was elected to serve an unexpired one-year term.

Fred Coulson closed the morning session with the executive address. Mr. Coulson was emphatic in stating that operating telephone men must keep up with scientific improvements that bring better service if they expect to please their customers.

"We are far behind the number of telephones that should be in service in Kansas as well as elsewhere," Mr. Coulson stated. "We must not stop our sales program until every home and business house has service. After there is a telephone in every home, we must continue our educational program until there are instruments correctly placed in all parts of the house. The telephone cannot reach the ultimate in convenience until these developments are carried out."

Mr. Coulson directed attention to the display of equipment that had been set up for the convention. He recommended that the telephone men get acquainted with these new ideas and adopt them for their



"Herb" Couch, of Topeka, Secretary of the Kansas Telephone Association, in his Report, Told of the Activities of the Association in Informing and Advising Member Companies on National and State Developments Affecting Their Interests.

exchanges. Operating men must adopt new ideas that are perfected by the engineers. We cannot expect our industry to grow if we allow our service to get antiquated.

Mixing wit with philosophy, T. A. McNeal, editor of the Kansas Farmer, as the first speaker of the afternoon session, took the telephone folks back through the years.

Mr. McNeal was assigned the topic "Seriously," but his talk was just the opposite. He has been active as a Kansas writer for more than 60 years. He kept the audience chuckling throughout his address.

Charles C. Deering, Des Moines, Iowa, secretary of the United States Independent Telephone Association, talked on "National Affairs." He went into detail concerning the NRA and the proposed Federal Communications Commission and steps that must be taken by Independent companies to comply with the regulations. All of the facts covered by Mr. Deering in his talk have appeared in TELEPHONY in recent issues.

Arrangements have been made to include members of the state association in the national association to facilitate application of the Independent NRA code. Mr. Deering expressed the opinion that some of the smaller companies may have to apply for exemption from some provisions. He is certain that everything will be worked out satisfactorily.

"State Regulation" was discussed by M. J. Healy, Topeka attorney. Mr. Healy

(*Please turn to page* 42.)

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Automatic Electric Exchanges of 400 Lines or Less

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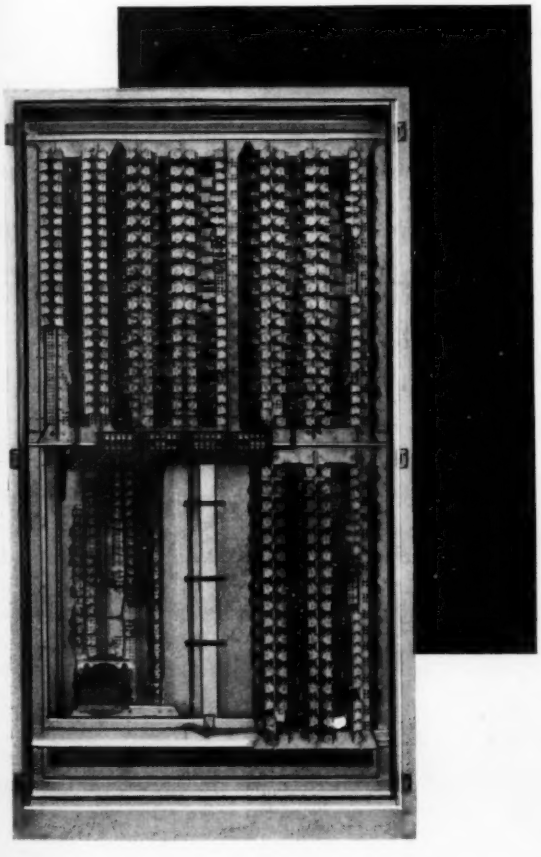

This illustration shows an All-Relay Community Automatic Exchange, having an ultimate capacity of fifty lines and six links. Provides standard full automatic service to central battery or local battery telephones.

BEFORE purchasing a small automatic exchange, an operating company should ask several important questions. One of the most important is, How much experience has the manufacturing company had in the small exchange field? How many small automatic exchanges has it actually installed?

The roll call of public automatic exchanges of 400 lines or less manufactured by Automatic Electric Company, now totals more than 500, and is being added to every day. It has successfully provided automatic equipment to meet every imaginable condition: such as grounded lines, long party lines, local battery operation, inter-town dialing, remote control, etc. It is important to note that the figure quoted above does not include the more than 3,000 private automatic exchanges sold and installed by this company.

There is no substitute for this experience, and it is this background which stands behind every Autelco automatic switchboard, whether of the all-relay or of the switch type, insuring the purchaser complete satisfaction in every phase of performance and operation. Write for descriptive literature today.

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1033 WEST VAN BUREN STREET **CHICAGO**

The central automatic equipment of the Type 33-A-6 P-A-B-X is composed of standard Strowger Automatic switches and relays of the same types as those used for Strowger Automatic central offices. It is enclosed in an all-metal cabinet with removable panels. The lower section of the cabinet contains the battery and charging machine. Dimensions are 4' 3" wide, 1' 4" deep and 6' 6" high.

REVITALIZE YOU P
With This New Al Pu

Private exchange business can, and should, vitalize companies must offer their business customers ment w modern services, especially designed to meet t needs, company's requirements.

As a practical contribution towards this e presen In this single, standard switchboard are combi the var tomer could desire. Its outstanding feature i provisio ferring incoming trunk calls from any non-restri telepho inet unnecessary.

This new system can be attended or una d—or out of the maximum of 20, may be allocated a restrict stricted. A simple but complete and effective call se telephones as code-sending stations. And al is with and two wires from each telephone to the switchboard.

Send for a copy of Circular 10, which the services and f of this system in d

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All Purpose P-A-B-X

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combi the various features any business cus-
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non-resti telephone, making an attendant's cab-

or una d—or both. Any desired stations
ocated a restricted, semi-restricted or fully re-
effective call service can be added, using the
And al is with standard dial type telephones,
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Study These Features

- CAPACITY—Any capacity up to 20 local lines and five trunks.
- SERVICES—Automatic intercommunicating service; in and out trunk service; holding and transfer service; code-call service.
- TELEPHONES—Unrestricted, for unlimited local and trunk service; fully restricted, for local service only; semi-restricted, for local and supervised trunk service.
- ATTENDANT'S CABINET—Unnecessary, but may be installed if desired.
- WIRING—Two wires to fully restricted stations; two wires and ground to all others.

When desired, an attendant's cabinet, illustrated above, is furnished in connection with this P-A-B-X. Can be instantly switched out of service when desired.

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Designed to be operated without line relays or other unnecessary complexities, this unit not only costs much less initially than any other type of central battery equipment, but costs less to maintain as well. And the service it offers is far ahead of that given by ordinary small exchange manual equipment.

The Monotype Community Switchboard is available in multiple and non-multiple types, and in any capacity up to 600 lines. Let us give you the actual figures on this remarkable switchboard for your exchange.

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Underground Toll Cable in Mountains

Dependable Telephone Service Necessary at Year-Round Mountain Resort in Southern California — Toll Cable Placed Underground — Methods Utilized to Install Cable in Mountainous Region — Unusual Conditions Encountered

By Dean M. Barnes,
Plant Engineer, Associated Telephone Co., Ltd., Los Angeles, Calif.

The snow scenes you have shivered through in a warm movie house are in Southern California, and they were taken in *real* snow. So real is it that the Associated Telephone Co., Ltd., operating an extensive telephone system in Southern California has found it necessary to bury its toll facilities in the area where the pictures were taken. Snow and sleet will never again interrupt telephone service between San Bernardino and Lake Arrowhead.

Lake Arrowhead is a year 'round mountain resort 22 miles northeast of San Bernardino. Crestline village, another resort, is on the mountain highway between San Bernardino and Lake Arrowhead. Large crowds of week-end pleasure seekers visit these and other resorts in this same section throughout the year and expect dependable telephone service regardless of weather conditions.

In January, 1933, several thousand persons attending a winter sports carnival were marooned for several days by impassable mountain roads, drifted high with snow from a severe blizzard. During these days the telephone system was severely taxed by the isolated athletic fans "checking in" at office and home.

A Heavily-Timbered Section Through Which Cable Was Laid. Open Trench for the Tape-Armored Telephone Cable Is Visible in Lower Left Corner.

The open-wire circuits which at that time connected the Lake Arrowhead unattended dial exchange with San Bernardino, passed through an isolated and rough section of the mountains. Some sections of the line were frequently damaged by sleet storms, in addition to heavy snow. Many times when these open-wire lines failed, it became necessary to give temporary service through twisted-pair placed on the surface of the snow for two miles.

Telephone Pole in San Bernardino Mountains, Calif., Supporting a Tangled Mass of Crossarms and Wires Loaded with Snow and Ice, After a Storm About a Year Ago.

Sleet, deep snows and inaccessibility made the lines difficult to maintain in winter; falling timber frequently interrupted service at other times. Costly maintenance and the obligation of providing adequate and dependable service to the mountain area, resulted in the placing of a toll cable from San Bernardino to the mountain resorts.

The project included a 51-pair, No. 19 gauge aerial cable from a point near the San Bernardino city limits to a point west of the Arrowhead Springs Hotel. This resort hotel, known to many visitors of Southern California, is located below a natural Arrowhead formation on the mountain side. Twenty-six pairs of the cable are loaded.

Open-wire circuits, consisting of .104 bare copper wire, serve the Arrowhead Springs Hotel from the terminus of the 51-pair cable. At the junction with the open wire, the cable is terminated in an unprotected cross-connecting terminal to provide a testing point and flexibility. Beyond this terminal, a 26-pair, No. 19 gauge aerial cable extends 4½ miles to Crestline village. Twenty-one of these pairs are loaded.

At Crestline village the toll cable is cross-connected through a protected terminal to a 26-pair local cable serving the

Rock Conditions Encountered in Placing the Tape-Armored Underground Telephone Cable in the San Bernardino Mountains.

village and other resorts to the west and north. Cross connection is also made to another 26-pair, No. 19 gauge aerial cable which extends easterly for approximately one mile towards Lake Arrowhead. Aerial cable was selected for the section near Crestline in preference to underground because of the requirements for frequent distribution, although its entire length is through heavy timber and subject to some hazard from fire and falling trees.

At a point approximately one mile east of Crestline village, the terrain is rough and very little distribution is required For these reasons, No. 19 gauge, tape-armored cable was adopted, and the most direct cross-country route selected. This involved digging and blasting a five-mile trench in a section which might look like home to a mountain goat, but which made construction men want to keep up their life insurance premiums. The only thing worse than digging the cable trench was trying to move in the cable reels.

The route of the trench was accessible to automotive equipment at widely-separated points. Consequently, the usual practice of feeding the cable into a trench from a moving dolly could not be followed. It became necessary to spot the reels, containing 2,000 feet of cable, at 2,000-foot intervals, by means of a caterpillar tractor or a truck.

Due to the characteristics of tape-armored cable with its spirally wound tapes and jute roving, it was undesirable to place continued strain on the cable itself when pulling it into position. A supporting steel messenger was strung in along the trench and attached to trees or stubs placed for the purpose. At 20-foot intervals, cable rollers were clamped to the messenger and a hand line extended from the cable reel through these rollers to the winch on a truck located at the nearest accessible location.

With this set-up, a 2,000-foot section of cable was pulled in and then dropped into the trench by releasing it from the rollers progressively from the reel. The supporting messenger with rollers was then moved ahead and the operation repeated.

All splices were made three feet above the ground, on short, full-treated poles, to facilitate the splicing operation and provide future accessibility.

The trench generally followed a section line with slight deviations to detour obstructions where right-of-way conditions permitted.

Markers to denote the exact route were inter-spaced at frequent intervals between the splicing poles, at each deviation and at road crossings. At the road crossings, these markers consisted of 4-inch by 4-inch redwood standards, painted white with the words "Cable Xing" stenciled vertically in black. The two-inch capped galvanized iron pipe was used for all other markers. All splicing poles and markers were numbered consecutively with standard pole tags to provide ready identification in the field and on the plant record maps.

A minimum depth of 18 inches was maintained for the trench, with this increased to 30 inches at road crossings to provide an added factor of safety.

The contour of the ground was followed. In many cases this required traversing steep slopes, deep canyons and rocky regions, and entailed several water-course crossings. It was found necesary to blast through solid rock in many places in opening the trench. One rocky section, 2,000 feet long, required blasting throughout its entire length.

A 15-pair complement was loaded in the cable between Crestline village and Lake Arrowhead. On the underground section, the loading coil cases were mounted on the splicing poles in an inverted position to permit the cable stub to extend directly to the splice without sharp bends at which an electrical breakdown might occur.

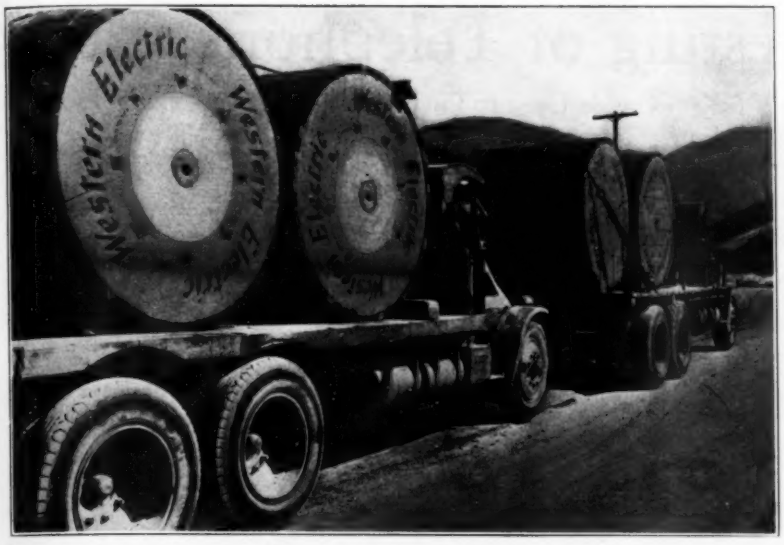
Full-treated poles, varying in length from 25 feet to 45 feet, were used for all aerial plant to provide fire resistant construction.

Unprotected terminals were used where limited distribution was expected and all lines entering these terminals will be equipped with station protectors mounted on the pole. Where several lines will enter the cable, protected terminals were installed.

At the junction of aerial and underground cables the aerial end was terminated in an unprotected terminal and the underground end in a 26-pair protected terminal, both mounted on the same pole. No.

Pole Terminal and Loading Case. The Cable Stubs from Each Extend Down to the Splice and Are Protected by Heavy Wood Molding.

Cable in Position to Be Lowered Into Open Trench Traversing Steep Hillside.



Some of the Tape-Armored Cable Placed Between Crestline and Lake Arrowhead, Calif. A Portion of the Natural Outline of the Arrowhead on the Mountain Is Seen in the Upper Right. In Some Cases the Reels, Weighing 4,300 Pounds Each, Had to Be Hauled by Tractors More Than a Half-Mile to the Trench.

14 copper drop wire was used to jumper all working pairs between these two terminals.

The Lake Arrowhead exchange consists of an unattended automatic central office and modern cable and wire outside plant. The North Shore area is served by a 26-pair, No. 22 gauge lead-covered cable, laid in the bed of the lake without protection. This cable, approximately one mile in length, is protected by fused cross-connecting boxes at each end, and is brought up to a cross-connecting box on a peninsula near its midpoint for testing.

Crestline and vicinity are served by common battery toll stations from San Bernardino.

Branch wire leads from this recently-completed cable installation are being built up so that service will eventually be available over a large area.

Owl Disrupts Service on Long Distance Circuits.

Disruption of telephone service over the north-south line through the interior of Oregon from The Dalles to Klamath Falls, Ore., was caused recently by a huge owl. Two circuits of the telephone lead were shorted-circuits when the big bird became entangled in the wires. R. M. Nedrow, lineman, found the owl hanging by its neck from the wires 18 miles north of Bend.

C. F. Mason, President of Associated Telephone Co., Ltd.

C. F. Mason, of Santa Monica, Calif., executive vice-president of the Associated Telephone Co., Ltd., was elected president of the company at a special meeting held April 13, to succeed the late S. L. Odegard who recently passed away.

At the same time A. L. Hart, operating vice-president, was made vice-president in charge of operations of the Associated Telephone Utilities Co., of New York, and will assume his new duties May 1. Succeeding Mr. Hart will be C. F. Johnson, former assistant to the operating vice-president, who becomes vice-president and general manager of the Associated Telephone Co., Ltd.

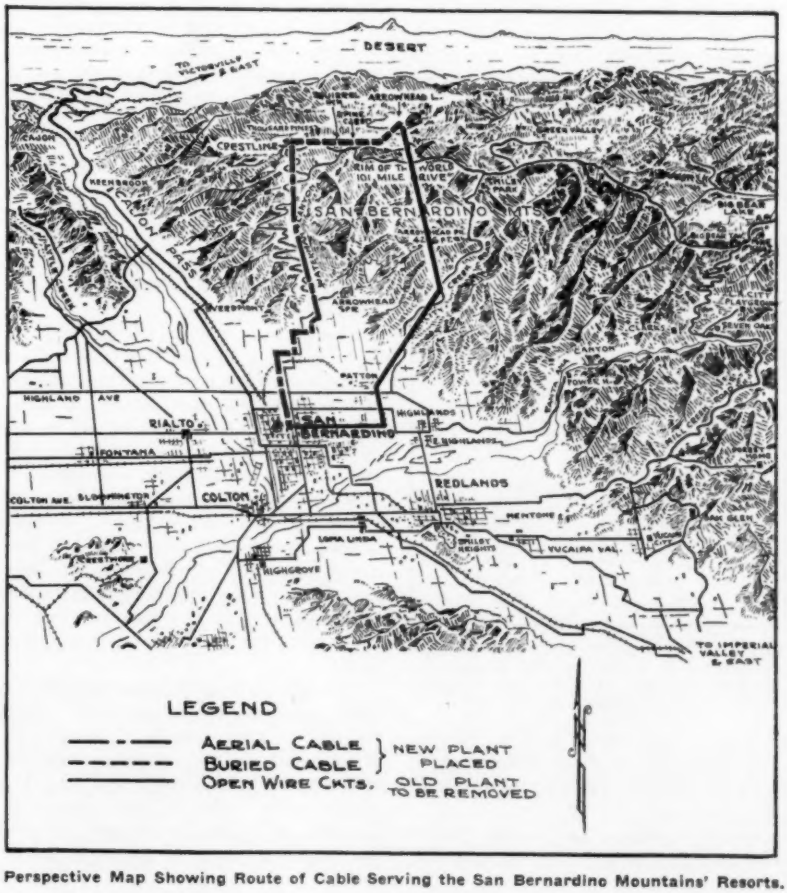
Mr. Mason, the new president, will have his headquarters at Long Beach main office of the Associated company, which serves 54 cities and towns in Southern California. He was at one time general commercial superintendent of the Pacific Telephone & Telegraph Co., and later owned and operated the company serving Santa Monica and Redondo. Mr. Mason joined the Associated organization in 1928 after disposing of his properties to that corporation.

Senate Committee Approves Modified Dill Communications Bill.

The modified Dill bill (S. 3285) for federal regulation of communications was approved on April 13 by the Senate interstate commerce committee with one dissenting vote. It is now on the Senate calendar awaiting action.

Many of the provisions of the original bill have been sharply modified since it was denounced by Walter S. Gifford, president of the American Telephone & Telegraph Co., as the "most drastic regulation ever presented." Last week's issue of TELEPHONY presented the principal changes made in the bill.

Consideration of the bill by the Senate probably depends on whether President Roosevelt desires enactment at this session.



Perspective Map Showing Route of Cable Serving the San Bernardino Mountains' Resorts.

Nitrogen in Testing of Telephone Cable

In Modern Cable Plant Nitrogen Gas Is Used to Facilitate Testing and Maintenance—Some Data Concerning Nitrogen and Its Handling for Various Purposes—Advantages of Nitrogen—Methods of Application of Gas to Cable

By F. P. Gross, Jr.,
Industrial Chemist, Air Reduction Sales Co.

Modern methods of testing and maintaining lead-sheathed cable call for constant assurance that the lead sheathing be tight. Obviously, the cable must be dry and so maintained that water will not be admitted in order that corrosion and short-circuits from this cause be prevented.

New cable leads are tested on installation and old lines are checked up periodically as a matter of operation or maintenance. The use of dry nitrogen gas for carrying on this activity is simple, inexpensive and efficacious.

Nitrogen occurs in the atmosphere, of which it is 78.03 per cent by volume. It is a colorless, tasteless, odorless gas, as we should expect from the fact that air possesses these properties. Chemically, it is represented by the symbol, N_2, since there are two atoms to the molecule.

Nitrogen is not inflammable, explosive, nor poisonous. However, an excess quantity of nitrogen in a confined space will cause difficulty in breathing, since nitrogen does not support life. This will be noticed by a more rapid breathing, and a feeling of heaviness on the chest, followed by a headache and will subsequently result in unconsciousness.

Temperature, Degs. Fahr.	Gauge Pressure, lbs. per Sq. In.
120	2,251
115	2,226
110	2,201
105	2,176
100	2,151
95	2,126
90	2,101
85	2,076
80	2,052
75	2,027
70	2,000
65	1,976
60	1,950
55	1,925
50	1,900
45	1,875
40	1,850
35	1,825
30	1,800
25	1,776
20	1,750
15	1,725
10	1,700
5	1,673
0	1,648

Table I. Pressure Variation of Nitrogen Compressed in a Cylinder for Changes in Temperature from 70° Fahr. and Pressure from 2,000 lbs.

Since it is possible for enough nitrogen to escape into a manhole, from a large leak in a cable under test, to affect the workmen, care should be taken to enter manholes slowly, and at the same time test for the presence of nitrogen by deep breathing. If the preliminary symptoms described are experienced, the manhole should be immediately vacated, nitrogen pressure shut off, and the manhole ventilated thoroughly before re-entering.

The density of nitrogen at 70° Fahr. and atmospheric pressure is 0.07265 pound per cubic foot. Conversely, at 70° Fahr. and atmospheric pressure, one pound of nitrogen will occupy 13.76 cubic feet.

Nitrogen is produced commercially by liquefaction of air and its subsequent distillation and rectification. This operation involves primarily a separation of oxygen and nitrogen, which is almost complete, since commercial nitrogen is furnished in cylinders with an oxygen content guaranteed to be less than 0.5 per cent. Actually, the oxygen content is in the neighborhood of 0.2 to 0.3 per cent by volume.

The compressor lubricants used in pumping nitrogen into the cylinders give rise to two terms descriptive of commercial nitrogen—water-pumped nitrogen and oil-pumped nitrogen. Water-pumped nitrogen will be free from hydrocarbons but contains a certain amount of moisture picked up from the lubricant in the compressor, whereas oil-pumped nitrogen will be dry but similarly contains an infinitesimal amount of hydrocarbon vapor from the compressor lubricant in its case.

The moisture content of nitrogen for cable testing is all-important. Oil-pumped nitrogen, developed to meet this requirement, contains less than 0.03 per cent moisture. Such gas is unsaturated and the little moisture present is well below the danger point for cable work. In fact, oil-pumped nitrogen has many times been used to dry out cables successfully in the field. In one case a section of cable fell into a river and after it was fished out, sufficient nitrogen was passed through to dry it thoroughly with practically no loss in time before the cable was put into operation.

Nitrogen is supplied at a pressure of 2,000 pounds per square inch at 70° Fahr. in cylinders approximately 51 inches high and 8½ inches outside diameter, weighing approximately 150 pounds full and 133 pounds empty. The cylinder content is such that the volume of nitrogen delivered will occupy a volume of 204 cubic feet at 70° Fahr. and one atmosphere pressure. However, the working content of such a cylinder is considered to be 200 cubic feet.

Regulators or reducing valves are equipped with gauges registering pressure in the cylinder and in the outlet line. At any given temperature the pressure in the cylinder is an indication of its content; that is, how full it is. Table I shows the variation in pressure of a full cylinder with temperature. Table II shows the cubic feet of nitrogen contained in a cylinder at 70° Fahr. for varying pressures.

Pressure, lbs. per Sq. In.	Cu. Ft. Measured at 70° Fahr. Delivered
2,000	204.0
1,900	194.5
1,800	184.7
1,700	174.7
1,600	164.5
1,500	154.5
1,400	144.5
1,300	134.5
1,200	124.5
1,100	114.2
1,000	104.0
900	93.5
800	83.1
700	72.8
600	62.5
500	52.0
400	41.7
300	31.0
200	20.9
100	10.4
0	.4

Table II. Volume of Nitrogen Delivered from a Cylinder of 2,644 Cu. In. Volumetric Capacity Starting with Various Pressures and 70° Fahr.

With regard to the actual application of nitrogen for testing and maintaining telephone cable under pressure, there is nothing unusual. The cable, or a certain length of cable, is blocked off and nitrogen admitted to a previously determined pressure, which is one that the cable will stand without injury.

Time is allowed for the pressure to come up to the desired reading at the far end, and the cable is allowed to stand for a certain period of time. During that period it is inspected for drop in pressure. Of course, if there is a drop, the leaks are immediately sought out and repaired.

Ordinarily, gas is admitted at the inlet end at a gauge pressure of about 30 pounds, and is allowed to run into the cable until a pressure of five to ten pounds is indicated at the end of the length under test. When the gauge reading at the end of the sec-

XUM

tion of cable indicate that it is moderately filled with gas, the cylinder valve is closed and the hose disconnected, leaving pressure in the cable.

Painting the joints with soapsuds will indicate, by the formation of soap bubbles, the location of any leaks that may be present. It is recommended that the gas pressure be left in the cable for a period of several hours, or even over night when possible.

Underground or inaccessible cables are pressure tested in this way by checking for a drop in pressure on standing. The ability of the cable to hold the pressure is proof that the sheath is in good condition.

Inability to build up pressure at the end of the section is indication of a large leak, which will have to be located and repaired before the test can be continued. Frequently large leaks can be discovered without the use of soapsuds, as the gas will make a hissing noise when it escapes from the cable and can be felt by running the hand over the sheath.

When testing sections of cable not in use, it is usually necessary to provide a dam by filling splices with paraffin. For sections already in service, a length of 2,000 to 3,000 feet is usually tested at one time and, in this case, it will probably be unnecessary to attempt to provide dams unless the cable is to be maintained under pressure at all times.

The gas may be applied in the middle of the length under test, and a pressure gauge used at each end to make sure that pressure has reached these points. For longer sections, the gas may be applied at two or more points.

The actual equipment, including the cylinder of nitrogen and a reducing valve, or regulator, is pictured in Fig. 1. In most cases, the user of this process will prefer to develop the equipment used for connecting the nitrogen hose to the cable and for registering the pressures obtained. However, the illustration will indicate one method, at least, of carrying on this operation.

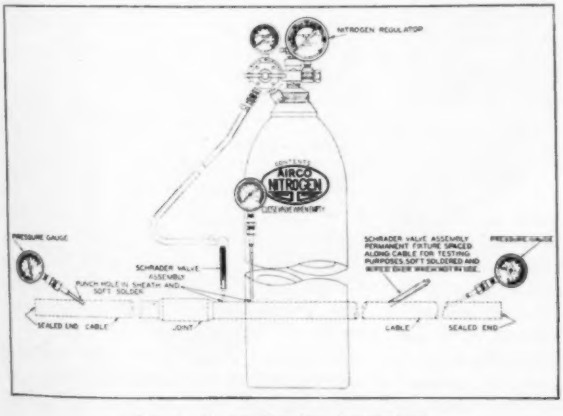


Fig. 1. Cable Testing Apparatus.

While the foregoing has been concerned primarily with testing cable, present-day operating methods call for maintenance of the pressure in the cable at all times, even after the test has been completed. With cables maintained under nitrogen pressure it is not possible for water to enter, due to a leak, until the nitrogen has escaped and the pressure lowered sufficiently.

On one occasion a leak developed in a main cable under a river. Until such time as repairs could be made, additional nitrogen was forced through the cable from either end at a pressure that prevented the water from entering. In addition, the escaping bubbles of nitrogen made it possible to locate the leak quickly. The success of this emergency use of nitrogen was proved by the fact that service over the cable was not impaired.

When cables are maintained under pressure they are divided into sections by dams of paraffin or other suitable compound. Each section is gassed separately. If 10 or 12 pounds of nitrogen pressure are maintained in the sections, connected with some suitable indicating device, immediate warning is given should a leak develop in the cable and the gas escape.

Whenever this occurs, a crew can be sent out to locate the leak and repair it. At the same time, sufficient nitrogen should be introduced again to build up the pressure to the proper amount.

For emergency work of this sort, smaller cylinders are frequently used. A size which will contain a volume equivalent to 24 cubic feet at 70° Fahr. and one atmosphere pressure has been found most satisfactory. It is possible for one man to handle this size of cylinder easily, whereas a standard cylinder, weighing in the neighborhood of 150 pounds full, is more unwieldy.

These small 24 cubic foot cylinders are likewise used in mountainous country where the telephone line crosses terrain only reached by foot. For ordinary work, the standard cylinder (containing 200 cubic feet) is used because of the greater vlume of nitrogen it contains.

With respect to the volume of nitrogen required for work of this type, one 200 cubic foot cylinder will test approximately 500 splices or about 10,000 linear feet of cable, with the gas admitted at 30 pounds pressure until the pressure in the cable equalizes throughout at 11 pounds gauge.

At current price for nitrogen, the cost of gas per joint on this basis would be somewhat over ½-cent each and the cost of gas per mile of cable would be approximately $1.50. These figures, based on average prices and average volumes of nitrogen consumed, are subject to adjustment on account of transportation costs, volume of gas, and other factors of a similar nature.

In general, it has been found desirable to pressure test all main underground toll, trunk and exchange cables, and aerial toll cables. Subsidiary cables, both underground and aerial, may be tested when their importance or other local conditions indicate the desirability of making such tests.

Standard Nitrogen Cylinders: A, Oil-Pumped; B, Water-Pumped; On Right, Emergency Nitrogen Cylinder.

In any event, the value of nitrogen lies in its freedom from moisture; and the value of the application in its insurance of satisfactory operation with a minimum of line trouble.

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The local managers of the company supply copies of the booklet to business men in their districts who are interested.

Role of Drop Wire in Telephone Plant

Hard Usage Given Drop Wire in Service—Drop Wire Troubles—Steps in Drop Wire Development and Improvements in Insulation—Improvements in Protective Covering—Published Through Courtesy of the Bell Telephone Quarterly

By H. A. Haislip,

Outside Plant Development Engineer, American Telephone & Telegraph Co.

The outside plant structure, known in telephone parlance as the "drop," is the insulated pair of aerial wires that connects a cable or open-wire circuit with the "inside" or house wiring of a subscriber's telephone.

While drop wires in some form are as old as the telephone business itself, the drop wire's history lacks the glamor that surrounds the more spectacular elements of telephone plant, and it has received little recognition in telephonic literature. Yet of the thousands of inanimate things involved in the romance of the telephone, few have had a more interesting part than drop wire.

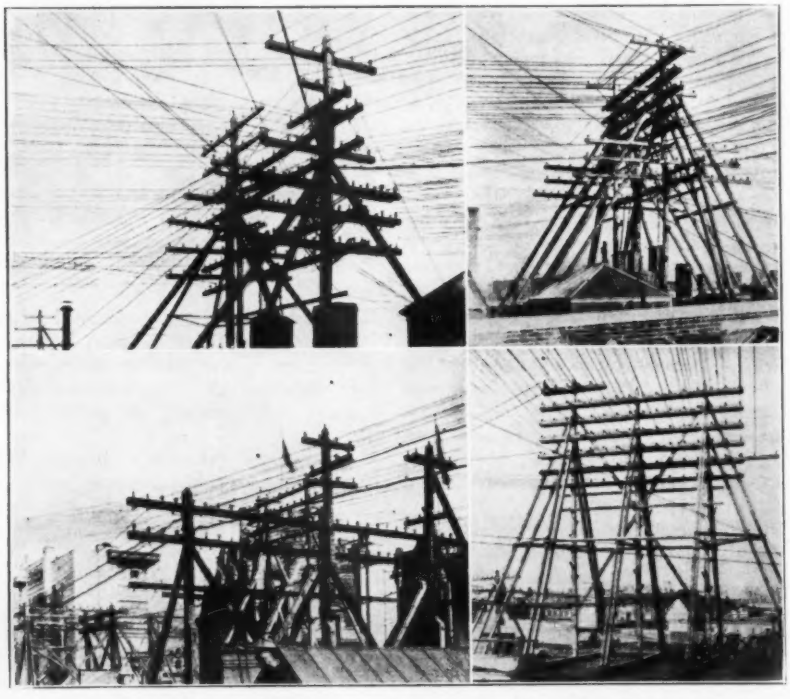

Fig. 1. Roof Structures in Boston, Mass., in the Early '90's. These Photographs Were Taken From the Annual Report of the Boston Wire Department for the Year 1894. In a Later Report It Was Estimated That There Were, in the Year 1894, 14,000 Roof Fixtures of All Kinds in That Portion of Boston North of Dover and Berkeley Streets.

It is unique in its adaptability to a wide variety of uses, and these many uses have kept it in close contact with human affairs when events large and small were marking epochs in the lives of many telephone people.

Besides its usual function of connecting aerial cable circuits to telephones, it is called upon to serve in the place of open wire and cables for the quick restoration of service after storm breaks and floods, to perform as temporary patching lines for the purpose of avoiding interruptions to service during construction and reconstruction work, and to serve temporarily as submarine cable and as line wire extending beyond the ends of cables.

Difficulties Imposed by Its Environment.

Drop wire is also unique in the diversity of the hardships it undergoes, which in some instances induce human hardships as well. In the well-designed aerial cable plant every element of the plant, including drops, is safeguarded as far as practicable against injury caused by existing or probable future conditions of its environment.

The poles have been selected as to size and height and have been carefully located; the cable has been fastened at predetermined heights on the poles and guarded by location and certain devices from wear or other injury by tree limbs, power wires and other things; terminals have been joined to the cable at certain poles which are most suitable for drop wire connections, and the drops are run from these points to subscribers' buildings by routes that introduce the least practicable hazard to the drops.

The drops, however, are installed after the cable and terminals are in place, some of them years afterward when the environment of the drops may have undergone an important change. Such a change may be due to the planting or growth of trees, changes in other wire services, or changes in the distribution of telephones.

Whatever the cause, it is common to find that many drops necessarily have a very unfavorable environment, where they are subjected to great abuse from which the more massive elements of plant, such as cable, remain relatively free. It is fair to state that, as compared with cable and most of the other elements of plant, the drop has the most vulnerable position.

Unlike the telephone and other inside equipment, which are well-housed and protected against the rigors of outdoor exposure, and unlike the cable which, though exposed outdoors, is systematically engineered into place and strongly supported, the drop must support itself outdoors in the gap between the cable and the building that houses the telephone, no matter whether the span be short or long, over, under, around or through trees or other obstructions.

By the very nature of the service it must render, it often must endure much abuse. The form of abuse which causes more drop-wire trouble than any other is abrasion, which is best illustrated by branches of trees rubbing against the wire. This wears off the insulation and reduces the insulation resistance of the wire to ground, especially during wet weather when the leakage may make the circuit inoperative.

Then it becomes an element in a human drama, a part of which may be heard but not told, for it is then the troubleman goes out into the wetness to find and clear the trouble; and if the sun comes out and dries him off, and thus relieves his physical discomfort, it may also dry off the drop, causing the trouble temporarily to disappear, which adds to his difficulty in locating it.

Trouble of this kind has been combated practically since the beginning of the telephone business, particularly by the specialists concerned with development work. It apparently began even before the drop received its present name.

Origin of Its Name.

It is found that the very early records refer to drops as "leading-in wires," "cut-in wires," or merely "exterior wires." How-

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ever, at least by 1895 the term "drop" was being employed, for we have a record of its use by the wire department of the city of Boston in the following rule promulgated by it in that year:

"To be brought below the roof of a building, the drop must commence at the top of the same building and run straight down between and not in front of windows, hoistways, etc., and as near the wall as the character of the service will admit."

This rule suggests that "drop" as applied to wire was then a well-known term and that it originated in connection with house top distribution. Another one of the rules makes it clear that the term was also applied to electric light and power wires.

The house top distribution referred to was the truly overhead system which is portrayed in Fig. 1. The line wires were run from building to building and block to block on fixtures such as these. Some of these fixtures were 36 feet high and carried 200 or more wires.

Major Development Steps.

It appears that originally there was no distinction between drop wire and line wire and that drops were merely bare line wires dropping from the line to the buildings. It was soon found, however, that wet tree limbs with which they were often in contact caused them to work badly. Troublesome tree conditions were also encountered in other parts of the lines and it was thought that the leakage troubles could be avoided by using rubber-insulated wires where tree contacting could not be avoided.

In the early '90's several different kinds of wire were being experimented with, tending toward the unified practice of all-insulated wire drops, and in 1896 the American Bell Telephone Co. issued specifications for hard and soft-drawn copper wire with rubber insulation. They covered four sizes of wire—.165, .104, .080 and .064 (expressed in mils)—and provided "when desired" for laying the wires "up in pairs, either twisted or straight."

The year 1897 saw rubber aging tests being made in the American Bell laboratory at Boston. Climatic tests were also used, and comparisons were made between accelerated laboratory tests and the test of actual service.

The records indicate that twisted pair became an American Bell standard in 1901, coincident with the issuance of specifications for "Twisted Pair of Rubber-Covered Hard-Drawn Copper Wires, No. 16 B. W. G. (.065-inch diameter)." It was intended primarily for use through trees and it did not entirely supersede other types of drop wires. In 1902 the specifications were revised and the gauge designation was changed from 16 B. W. G. (.065 inch) to 14 B. & S. G. (.064 inch).*

This wire, which was also hard-drawn, became known as "14 twist" and it afforded such great improvements in service and handling properties over the several types of wires used previously that those who participated in its early use never ceased to venerate it. It still holds an exalted place in the minds of many pioneers who now occupy positions of all ranks in the Bell System, and it would be almost sacrilege for one to deny that it was superlative wire.

It may be said, however, that the knowledge of the properties of materials and rubber technology have been advanced during the last 30 years, so that although the early 14 twist may have been a superlative service wire, its present successor with certain other points to its credit needs no apologist. For one thing, it cost the Bell System during the last five years about $7,000,000 less than 14 twist would have.

Although the use of 14 twist for drops was practically discontinued in 1910, it has continued to be used to a limited extent for various other purposes.

At about the time when 14 twist came into being, the common form of distribution was rapidly changing from the open-wire type to the cable type, and this seems to have caused greater attention to be focused upon drop-wire performance.

Open-wire lines through trees, of course, gave a great deal of trouble, and open-wire drops, although an important source of trouble, were not conspicuous on this score; but when open-wire lines were replaced by cable, the open-wire drops were found to be the most important source of trouble. It was natural, therefore, that 14 twist should have been so cordially adopted.

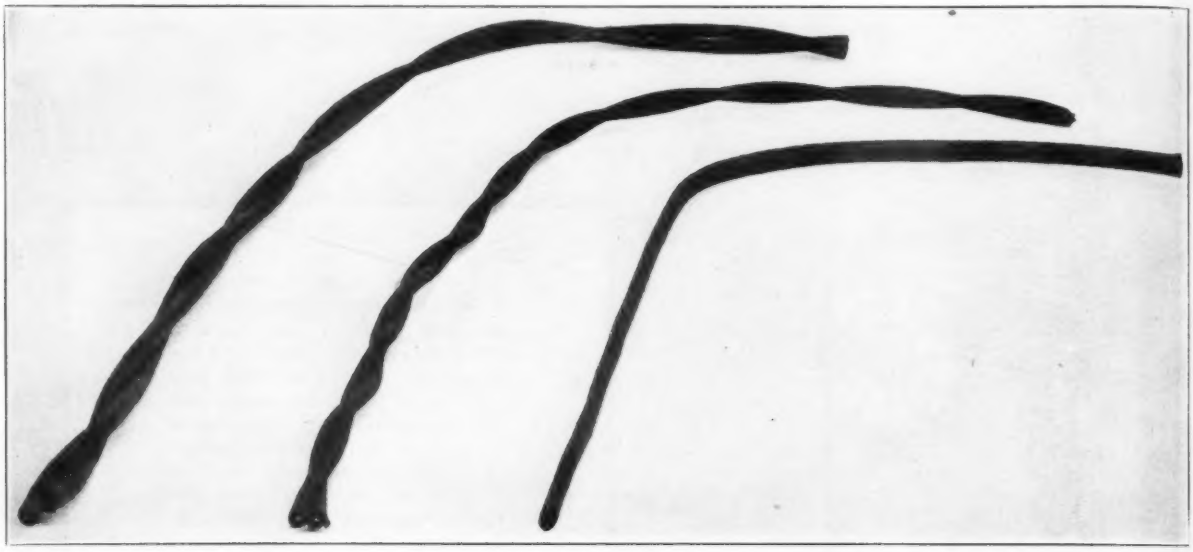

Fig. 2. Three Stages in the Development of Drop Wire Used in the Bell System: Left, No. 14 B. & S. Gauge Hard-Drawn Copper Twisted Pair; Center, No. 17 B. & S. Gauge Bronze Twisted Pair; Right, No. 17 B. & S. Gauge Bronze Parallel Wire.

The trend from exchange open wire to cable distribution is disclosed by the following table of approximate wire mileages in the Bell System as at certain year ends:

Year	Miles of Exchange Aerial Wire Exclusive of Drop Wire: Open Wire	Miles of Exchange Aerial Wire Exclusive of Drop Wire: Wire in Aerial Cable	Ratio of Miles of Exchange Open Wire to Total Miles of Exchange Aerial Wire
1900	420,000	225,000	.65
1905	915,000	1,245,000	.42
1912	1,179,000	3,628,000	.25
1922	1,064,000	6,447,000	.14
1932	1,169,000	17,021,000	.06

Notes: Previous to the year 1911, the plant measurement reports at headquarters showed no separation of total miles of exchange aerial wire between open wire and wire in aerial cable. The figures of 420,000 and 915,000 miles are estimates.

The open-wire figures for 1900 and 1905 include a small amount of covered wire along the lead which could not be separated out. The open-wire figures for the other years are bare wire only. None of the open-wire figures include any drop wire.

The first successor to 14 twist for drops was 17 B. & S. G. copper-steel twisted

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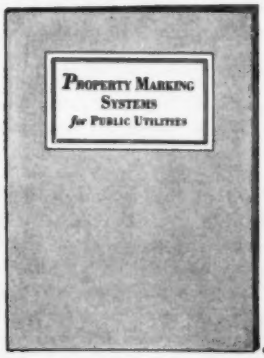

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pair, which was standardized in 1910, and this in turn was succeeded by 17 B. & S. G. bronze twisted pair in 1921. The insulated conductors of these types were separately braided and waxed before being twisted into pairs.

The parallel type of wire in which two insulated conductors are covered by a common braid came into system-wide use in 1924. The present standard drop wire is of this type and consists of No. 17 bronze conductors which are coated with tin, insulated with rubber compound, and two such conductors sheathed with cotton braid which is saturated with a preservative and coated with weather and wear-resisting pitch and flake mica.

It is available with two types of braid covering, one being made of coarser, harder cotton yarn than the other so as to afford needed protection to the insulation against severe exposure to abrasion. This resistant braid wire, as it is called, costs more than the other, but its higher cost is more than compensated for by its greater endurance in the many cases where there is no alternative to running the wire through trees.

Obviously, there are many more cases where the path of the drop is, at least relatively, free from obstructions and where the wire with the less resistant braid is the more economical one to use.

Three types of drop wire discussed in the preceding paragraphs are illustrated by Fig. 2. No. 17 B. & S. gauge copper-steel twisted pair had the same dimensions and the same appearance as the bronze pair shown in the center of the figure.

Aside from its physical properties, drop wire is a relatively short-lived part of the plant, being subjected to frequent changes associated with the station turnover and with any reconstruction of the open wire and cable plant, so that a vast amount of it is used year in and year out throughout the Bell System. The record shows that during the five years ending December, 1932, nearly 2,000 million pair feet were installed.

The reasons that have led to one change after another in drop wires are, obviously, the need for wire that would be more resistant to destructive influences, and the desire for economy. Mention has been made of abrasion as a cause of drop-wire trouble. It is responsible for more than one-third of the troubles.

Development work has gone a long way toward preventing abrasion troubles on wire that has been installed during the last few years, and it is expected that, as the ratio of new type wire to old type wire increases, the relative number of abrasion troubles will diminish appreciably. Other injuries to insulation account for about one-sixth of the troubles. The crushing or shearing of the insulation at points of support or other pressure points is one of these, and in this case also development effort has been well spent.

Nearly one-half of all the troubles, however, are caused by storms, falling trees, motor vehicles, animals, people, and a wide variety of accidental events which can be affected but little by changing the properties of the wire; and the efforts to reduce such troubles, therefore, have been made in other directions.

Rubber compounds, such as those used on drop wires throughout the last score or more years, are inherently good insulators when new, but until a few years ago all of the compounds deteriorated rapidly, due to oxidation. The engineers of the Bell Telephone Laboratories attacked this problem of oxidation and after much experimenting made marked progress in solving it by developing insulating compounds containing certain substances known as anti-oxidants, which were being used to some extent in rubber tires.

A generally-accepted view as to the part played by anti-oxidants is that they function as inhibitors and by their presence in the rubber compound retard the normal oxidation or aging rate. They have the practical effect of greatly extending the useful life of the insulating compound.

In development work of this kind, which involves a selection of the best materials from a large number of possible choices, an essential part of the problem is the development of testing methods.

In this case it was necessary to develop an accelerated aging process that would simulate the slow, natural aging of the compounds in the telephone plant, and also special testing equipment and procedures that would give a reliable indication of the vital qualities of the wire, both when new and after accelerated and natural aging. Otherwise, many years would have elapsed before a proper choice could be made and before there could be definite assurance that some detrimental features had not crept in.

A quick aging process had already been developed for certain uses in the rubber

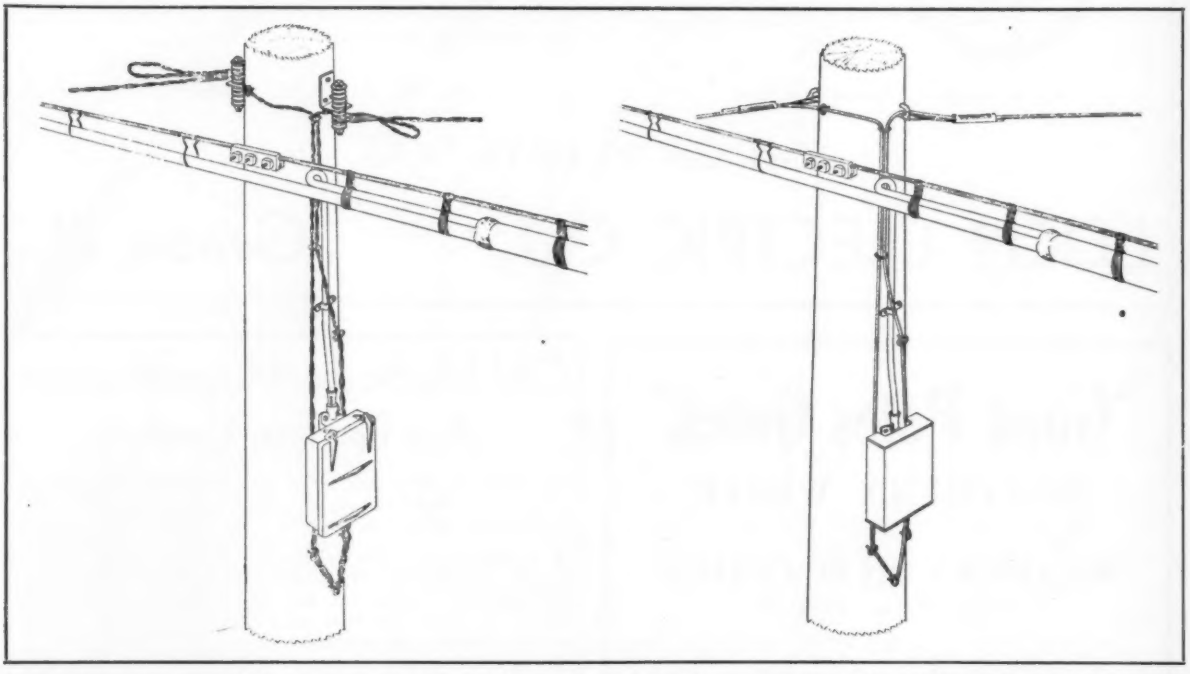

Fig. 3. Distribution From Aerial Cable Terminal Illustrating the Use of Twisted-Pair Drop Wire and Dead-End Ties. Fig. 4. Distribution From Aerial Cable Terminal Illustrating the Use of Parallel Drop Wire and Attachments.

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industry, and this was adapted to drop wire. As in the older work, this recent work followed the formula established in the old Boston laboratory in 1897 of making climatic tests and comparisons between the rapid test and the test of time. A new type of testing machine was also developed to measure the compressive strength of rubber insulation.

This machine and the rapid aging process put rubber insulation on a far better basis than it had ever been, and this resulted almost immediately in marked improvement in the quality of drop-wire insulation. The compressive strength of the insulation as now manufactured is at least twice that of new wire only six years ago; and after aging the equivalent of three or four years in the plant, the comparison favors the present wire by a ratio of about 5 to 1.

This means that the present wire should be better when it is three or four years old than was new wire six years ago, and it indicates a long useful life for the present wire. When rubber compound of the general type under discussion has greater compressive strength, it also has greater toughness, which means greater ability to endure the kinds of abuse to which drop wire is ordinarily exposed.

Improved Protective Covering.

Even though the insulating compound has been much improved, it still needs further protection against its worst enemies: rubbing tree limbs, and sunlight. The means for accomplishing this is to enclose it in a lightproof covering that will resist abrasion and withstand a wide variety of weather conditions.

For many years the covering has consisted of a cotton yarn braid which has been treated with weatherproofing materials. These materials and the methods of applying them have undergone a number of changes throughout the years, but similar to the experiences with insulating compounds, quantitative measurements of results had to come before there could be definitely predictable improvements in serviceability.

To this end certain weatherometer and rubbing tests were developed in the Bell Laboratories, and by their aid a new system of treatment of the braid was developed which will effect an important extension to the life of the braid and should improve abrasion resistance as much as five to tenfold.

Only the most important aspects of the role of drop wire proper are discussed in the foregoing and, therefore, it should be stated that the solution to the general drop-wire problem has not depended wholly upon improvements in the wire.

The means for holding the wire in suspension and for terminating it have always been important features, and a large amount of work has been done toward perfecting them. It is not the present purpose to discuss that work, but it may be said that these attaching means have also been de-

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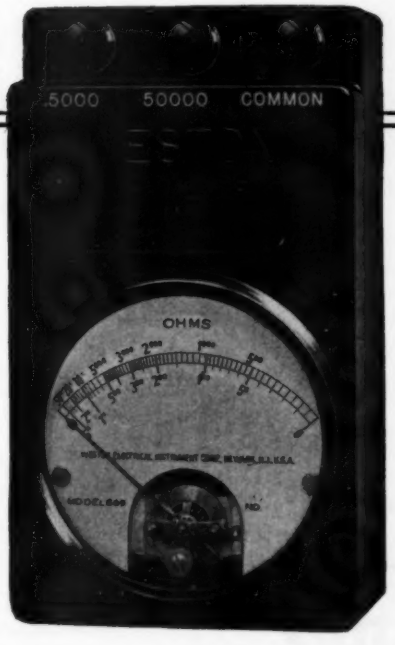

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veloped through many stages by which there has been achieved a more nearly trouble free and better-looking drop structure.

The trimness of parallel drop wire supported by its inconspicuous attachments makes a pleasing contrast with the old style drop with its bracket and looped tie. Figs. 3 and 4 represent the appearance of typical terminations of old style and new style drops.

The many unwritten pages of the drop wire's history have in them much of the lives of an army of telephone people, who at times have found it an indispensable aid in restoring telephone service after disasters, such as those caused by upheavals of nature, and who at other times have had their souls tried by its failure to surmount its handicaps of environment.

Despite the vicissitudes, however, which are inherent in its function, and which are greater than those of any other item of telephone plant, it has evolved step by step into more and more useful forms.

Hearing on Communications Bill

Proponents of Rayburn Bill for Federal Commission Heard by House Committee—State Commissions Endorse Bill—Amendments Suggested by Navy Department and Radio Commission

The hearing on the Rayburn bill providing for a Federal Communications Commission opened in Washington, D. C., on Tuesday, April 10, before the House committee on interstate commerce. Testimony of proponents of the bill was taken on that day and the following day when Chairman Sam Rayburn continued the hearing, setting Thursday, April 19, as the tentative date. Later Tuesday, April, 24, was designated.

Secretary of Commerce Daniel C. Roper appeared before the committee at the opening of the hearing on April 10 and urged enactment of legislation to regulate the nation's communications system. He told the committee that the inter-departmental committee, which was formed last summer at the request of the President, was unanimously in favor of federal control over radio, telegraph and telephone companies.

"The committee did not submit a bill to either house of Congress, feeling that with the help of the information gathered, the House and Senate committees would be able to draft their own legislation," he said.

Captain C. S. Hooper, director of naval communications, said the contemplated regulation should be designated in the interests of national defense as well as for protection of public interests.

"For many years," he said, "the Navy Department has been concerned with the inroads into United States communications systems by foreign interests. It is believed the time will come when all nations will insist on ownership of their own communications by their own nations, as all the major powers do now except the United States."

He urged the amendment of the measure introduced by Representative Rayburn, along the lines of the bill proposed in the Senate by Senator Dill and stressed the need for "strengthening foreign ownership restrictions," urging that foreigners' holdings in American communication systems be limited to 20 to 25 per cent in non-voting stock.

The five amendments suggested by Captain Hooper would specify in the preamble the national defense objective; require the proposed Federal Communications Commission to outline a national communications policy and recommend it to Congress; make it clear that any secrets involved in testimony from the military services in hearing not be made public; strengthen the foreign ownership restrictions, and give to the President specific authority to take over wires and cables as well as radio facilities in time of national emergency.

The National Association of Railroad & Utility Commissioners and the Federal Radio Commission on April 11 approved the bill. K. F. Clardy of the Michigan Public Utilities Commission told the committee that the national association of commissioners had endorsed the bill but urged that no provision be incorporated which might deprive the state commissioners of rights to govern intrastate rates and services.

Paul A. Walker, of Oklahoma City, chairman of the Oklahoma Corporation Commission, said state commissions were unable to deal with telephone companies.

"At present there is little or no regulation of telephone rates and services," Mr. Walker said, adding that the telephone "problem is so vast" that state commissions are "virtually powerless to regulate rates."

"We received an appropriation of $20,000 in Oklahoma to investigate the rate charged by the Southwestern Bell Telephone Co.," he said. "While we were making the survey, the corporation itself spent $300,000 to make an identical investigation. It is easy to see that the survey undertaken by the commission amounted to little."

Several important amendments were recommended by E. O. Sykes, chairman of the Federal Radio Commission. They dealt with the supervision of the broadcasting division of the news agency and governing American-originated programs coming in from Mexico and foreign countries.

He recommended that the jurisdiction of three divisions created under the bill be changed to give to the radio broadcast section control over all matters related to broadcasting and amateur service.

XUM

WASHINGTON SITUATION: COMMUNICATIONS BILL.

(*Continued from page* 14.)

This indicates an intention to regulate toll rates downward, which will be of paramount importance to the Bell long lines department.

The statement that "small telephone companies are not operated as efficiently and economically as the larger companies" will convince many local telephone men that Dr. Splawn is not fully informed.

The records will show that hundreds of the local companies serving smaller communities are shining examples of rigid economy. Their simple methods and modest overhead may account for their lack of some of the so-called "efficiency" of which the larger concerns boast, but their careful management certainly makes for economy, and, generally speaking, renders their subscribers a grade of service that is fully worth the usually low rates paid for that service. So far as the smaller telephone companies are concerned, economy is the first lesson in their books.

The Communications Bill.

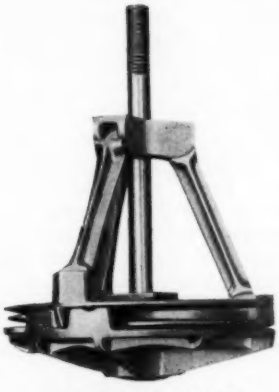
The telephone code hearing resumes next week, and the discussions over the Dill and Rayburn Communications Commission bills continue, with, however, no certainty that the legislation will be enacted before Congress adjourns.

The National Association of Railroad and Utility Commissioners has endorsed the Rayburn bill, with the proviso that there must be a clause inserted assuring the state commissioners undisputed control over intrastate rates and services. In other words, the state commissioners are for the bill if it does not interfere with their present jurisdiction and powers over intrastate traffic.

By the same token, all other critics of the bill would probably withdraw their objections if it were amended so it would not apply to them individually, but obviously there would not be much of the bill left in the end.

Most telephone companies chiefly engaged in local business have no objections to a federal commission to regulate interstate service, but it is admittedly difficult to establish a system of control that will differentiate between the two kinds of traffic. The local companies prefer to deal with their state commissions rather than be regulated from Washington, so on that point they are in agreement.

A SUPERIOR LINE OF GUY ANCHORS



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Everstick offers a complete line of Guy Anchors including 2-way, 3-way and 4-way Expanding Anchors—Cone Anchors—Screw Anchors—Take-up Clamps—Wire Splicers—Strain Insulators—Tamping Bars—Rods—Auger Handles—Strand Benders—Earth Augers. ***Latest Bulletin mailed on request.***

THE EVERSTICK ANCHOR CO.

MAIN OFFICE AND PLANT - FAIRFIELD, IOWA

EVERSTICK ANCHORS...

It is interesting to note how completely interwoven in all the discussions about communications regulation and control is hostility toward monopoly. The Splawn report cites the fact that the Bell organization is a monopoly as ample justification for federal government regulation and revamping of its telephone methods. Both Senator Dill and Representative Rayburn in their communications commission bills declare against monopoly.

Closely identified with this issue is the principle that the right of free speech ("freedom of the press," they call it) must be preserved. Monopoly of communications threatens this right, and whether this monopoly lies in the government or in private management the danger is equally apparent. Hence, the anxiety of the lawmakers at Washington to keep their records clear on this point.

KANSAS URGES STRONG SELLING EFFORTS.

(*Concluded from page* 24.)

formerly was associated with the Kansas Public Service Commission. He explained the relation of the state regulatory body to the telephone companies and brought out points that will assist in cooperation between officials and the utilities.

B. C. Burden, transmission engineer, Lincoln Telephone & Telegraph Co., Lincoln, Neb., demonstrated the cathode ray tube and described how the home of the future will use it to receive television programs. He showed how speech "looks" by breaking up sound waves with the ray. He explained the use of "suppressors" to eliminate telephone equipment interference with radio reception. This was of essential interest to the telephone men and was very clearly presented.

A dinner and dance were held for the visitors on the roof garden of the hotel on Thursday evening. Foster Lamming, Tonganoxie, and Sewell Black, Southwestern Bell Telephone Co., Topeka, were in charge of entertainment, and everyone enjoyed the hilarious party. These master entertainers also provided an unusual performance for the golfers when they assembled for the presentation of prizes the previous evening following the golf tournament.

E. T. Mahood, Southwestern Bell engineer, talked on "Depreciation" Friday morning. By the use of slides, he demonstrated how depreciation expense is evolved and explained what factors enter into the percentage that is set up each year for various plant items.

"A good thought to memorize," stated Mr. Mahood, "is that depreciation expense is the loss brought about by the ultimate expiration of the service life of major plant units." He also suggested that plant accountants should take more care in separating maintenance and depreciation items.

The open forum discussion was led by Glen E. Gaston, Kansas Corporation Commission, on "Accounting"; F. M. Browne, Western Telephone Corp., Kansas City, Kans., on "Collections"; and M. R. Campbell, Inland Telephone Co., Wellsville, on "New Business."

The discussion brought out the general opinion that each company should give special attention to the credit situation, and push the sale of service to the limit. Reported slight gains in customers are general and the trend is better.

Telephone men have a hard job ahead of them in getting new business was the thought expressed. Every employe must be developed into a trained salesman and kept on the assignment of interviewing prospects as much as possible.

At the executive dinner on Friday noon the directors re-elected Samuel Tucker, Pleasanton, president; Fred Coulson, Abilene, executive vice-president; Herb Couch, Topeka, full time secretary; and Estella Henderson, Pleasanton, treasurer.

Many stayed over Friday afternoon to discuss equipment developments with the supply men and prolong their visit with friends from other sections of the state. The meetings were "short and sweet"; the talks were timely; and it was a most profitable convention in the advancement of new ideas and stimulating thoughts.

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Describes the construction and operation of subscribers' station and central station equipment used in manually-operated exchanges. The treatment is simple, practical and well-illustrated, covering the various types of instruments and switchboards in their entirety and also their component parts. Gives attention to special phases of central-office practice, such as theory and practical details of current supply to all lines from a common source, etc. 439 pages, 6 x 9, 327 illustrations, $5.00.

Vol. 3—Automatic Switching and Auxiliary Equipment

Gives a simple and thorough treatment of automatic switching beginning with a discussion of substation dials and exchange numbering plans and extending to a detailed description of equipment and circuits for step-by-step, panel, rotary and all-relay systems. It also covers some auxiliary equipment common to both manually and automatically operated exchanges. 494 pages, 6 x 9, 287 illustrations, $5.00.

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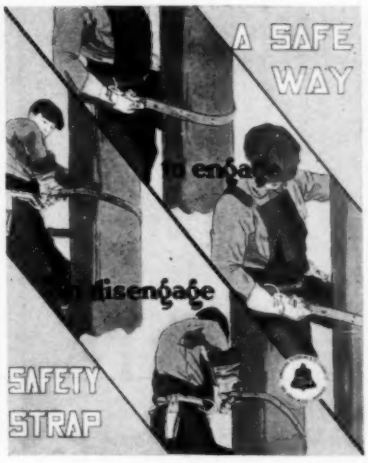
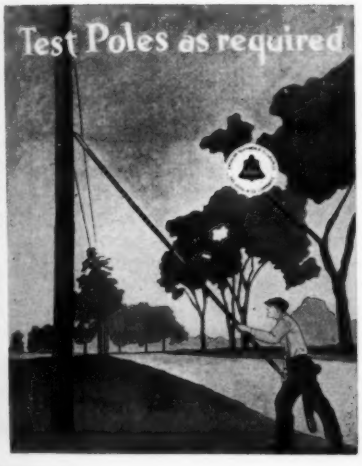
XUM

A Page of Safety Practice Suggestions





see path from furnace to manhole is clear
grasp hook firmly.
raise pot clear of furnace.
hold away from legs.
Where practicable 10 feet or more, on downhill side

IN HANDLING POLES
always keep at least ONE FOOT of winch line between the derrick sheave and the attachment to the pole.
attach winch line around pole with hook in this position

Leave space enough in which to STOP!
Car ahead may Stop suddenly
SHORTEST POSSIBLE STOPPING DISTANCE ON DRY LEVEL ROAD WITH BRAKES IN GOOD CONDITION
MILES PER HOUR
FEET TO STOP
2 Wheel Brakes
4 Wheel Brakes
20 39 22
25 60 35
30 88 50
35 120 68

Sectional ladder is designed for use only where fixed supports for top and bottom are available
use on strand work may cause sections to pull apart.

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Item	Recommended Types and Sizes	Use
Guy strain plates	4 ins. by 8 ins. by 14 ins.	For preventing heavy guys or strand dead-end from cutting pole.
Insulators	Single groove, green glass	For rural or exchange lines.
	Deep groove, double petticoat green glass	For toll lines.
	Two-piece, green glass transposition	For rural line transpositions.
	Two-groove, and single or two-groove parallel type	For twisted pair and parallel type drop wire.
Nails	60-penny (upper hole)	For attaching wood brackets to poles.
	30-penny (lower hole)	
Pins (wood)	1¼ ins. by 8 ins.	For use on rural, toll and exchange lines.
	1¼ ins. by 9 ins.	Use with two-piece glass insulators for rural transpositions.
Pins (steel with wood core)	½ in. by 5 ins.	For use with galvanized transposition brackets.
Paraffin		For boiling out paper-insulated telephone cables.
Pole steps	⅝ in. by 10 ins. hook head	For stepping terminal poles.
Rods (ground)	½ in. by 6 ft. (galvanized with tail)	For grounding subscribers' stations.
Screws (lag)	½ in. by 4½ ins.	For attaching crossarm braces to poles, etc.
Tape	Friction and rubber	For splicing work on drop wire.
Sleeves	Sizes to fit both drop wire and open wire	For open-wire and drop-wire splicing.
Washers	Galvanized square type, ¾ in. by 2¼ ins.	For use in attaching crossarms to poles.
	Round type, ½ in. by 1¼ ins.	For use with ⅜-inch bolts.
Wire	Bare copper and iron and insulated drop wire	For wire work.
	No. 14 copper ground wire	For grounding protectors at subscribers' stations.

Standard Material List—Inside Plant

Item	Use
Carbon tetrachloride	Cleaning relay and key contacts.
Forms	Trouble reports, toll tickets, trouble tickets, cable record sheets and cards, etc.
Wire	Main frame jumper wire, duplex and triplex inside instrument wire.
Repair parts for switchboard office apparatus	Contact springs for ringing machines, brushes, switchboard cords, plugs, switchboard lamps, operators' transmitters and receivers, and cords.
Repair parts for subscribers' instruments	Receivers, transmitters, induction coils, condensers, generators, desk and receiver type cords, fuses, arrester blocks and micas, shells and caps for receivers, mouthpieces, receiver diaphragms, No. 6 dry cells (telephone type), air cell operators' transmitters and batteries.
Solder	Rosin core solder only for inside work.
Nails and screws	For substation installation.

Standard Tool List.

Shovel (straight) 8 ft.	For pole-hole digging.
Shovel (spoon)	For removing dirt from deep holes.
Shovel (round point, short handle)	For handling loose dirt around poles.
Bar (digging bar)	Useful in hard soil or in going through frost.
Spade (tile)	For trenching work.
Auger (earth auger)	For patent anchor poles.
Pikes (several needed)	For erection of heavy poles.
Tamp (wooden with iron shoe)	For tamping dirt around poles.
Fork (raising fork)	For use in erecting heavy poles.
Wrench (lag screw)	For pole line hardware.
Ax (hand ax)	For tree trimming, etc.
Ax (regular ax)	For pole work, tree trimming, etc.
Blocks (6-inch, three sheave with ¾-inch rope)	For pole erection work, etc.
Grips (two pairs complete with blocks)	For pulling up line wire.
Grips (one pair with large Haven grips)	For pulling cable-supporting strand and down guys.
Chisel (2-inch)	For framing poles.
Hand line (manila ½-inch, 40 feet)	For general use pulling material up to lineman, etc.

Tape (100-foot steel measuring tape)	For general use in outside plant work.
Saw (carpenter's hand saw)	For general use, pole framing, etc.
Brace and bits	For pole work. Bits should be assorted sizes.
Hammer (carpenter's claw type)	For general use.
Payout reel	For wire-stringing work.
Takeup wire reel	For removing wire from plant.
Tree trimmer	For tree-trimming work.
Linemen's tools	Safety belt and strap, 7-inch side-cutting pliers, wrenches, linemen's hooks and straps, sleeve-twisting pliers, etc.
Tool bag (electrician's canvas type)	For carrying tools in connection with station installation.
Drills (small masonry drills)	For use in placing knobs on brick or concrete buildings.
Ladder (light extension, 28 ft.)	Useful on cable repair work, and in installation work.
Ladder (12-foot light ladder)	Useful in station installation work, tree-trimming etc.
Saw (hack saw)	For cutting messenger, bolts, etc.
Cablemen's tools	Splicing platform, furnace and torch, shave hook, paraffin kettle, canvas bucket, tent, sheath knife, sheath dressing tools, wiping pads, etc.
Inside men's tools	5-inch, diagonal pliers; 5-inch, long nose pliers; duck-bill pliers, cabinet type screwdrivers, relay adjusting tools, special plug and jack gauges, burnishing tools, hand drills, special switchboard tools.

Construction and Maintenance Cars.

Equally important with an adequate set of tools and a supply of standard material is the service and construction car. Because of the many different material items and tools which must be carried in a telephone maintenance car, a specially-designed body, fitted with compartments is almost a necessity. The essential requirements for a maintenance body is that it have sufficient room and compartments for all necessary material items and tools and that all compartments are conveniently placed and readily accessible.

The requirements for a construction truck are considerably different from those for a maintenance car. A plan followed by many smaller companies with good results is to use a light maintenance car equipped with a standard maintenance steel body and a good draw bar. On heavy construction work, a trailer with the heavier material can be hauled around by the lighter maintenance car. Then, if necessary, the trailer can be left at the location where construction work is in progress while the maintenance car is used to take care of regular service maintenance.

Pennsylvania's Annual Convention Next Month in Harrisburg.

The annual convention of the Pennsylvania State Telephone & Traffic Association is to be held at Harrisburg on Friday and Saturday, May 18 and 19, in the Penn-Harris Hotel. H. E. Bradley is president and M. E. Cunningham secretary of the association with headquarters in Harrisburg.

New York Up-State Association to Hold Convention Next Month.

The Up-State Telephone Association of New York will hold its annual convention in Syracuse on Wednesday and Thursday, May 23 and 24. Vice-President and General Manager J. G. Ihmsen, of Albany, states that the hotel in which the convention will be held will be announced later. A good attendance is expected, because of no meetng last year.

Companies Cooperate with Ohio State Highway Patrol.

Recognizing the vital necessity of prompt and swift intercommunication in the statewide activities of the Ohio State Highway Patrol, Highway Director O. W. Merrell and Colonel Lynn Black, patrol superintendent, have called into play the full facilities of the telephone industry.

Particular attention has been given by patrol and telephone officials to the problem of making as efficient as possible the system of communication for the patrol. Under this system, reliance is placed chiefly on the telephone in the patrol's wide-flung operations. Through the communicative advantages which the telephone offers in the way of quick contact between patrolmen and the public, the state highway patrol is in a position to effect better and more effective law enforcement.

Telephone officials have made arrangements with Director Merrell and Colonel Black for local telephone exchanges, in the vicinity of patrol district headquarters and outposts, to cooperate with the patrol by reporting any accidents or other emergency calls received by the operators, so that the patrol can render maximum service to the public.

Calls to the nearest patrol station bring service, ranging from the supplying of pertinent information and acting as patrol escorts on special occasions to investigating accidents. Patrol officials say that in case of emergency, citizens should call the nearest patrol station.

Prices in the Metal Markets.

New York, N. Y., April 18: Copper—Quiet; electrolytic spot and futures, 8½c. Tin—Steady; spot and nearby, $55.45; futures, $55.55. Iron—Quiet, unchanged. Lead—Steady; spot New York, 4.25c; East St. Louis, 4.10c. Zinc—Barely steady; East St. Louis spot and futures, $4.35. Antimony—Spot, $7.95.

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What the Commissions Are Doing

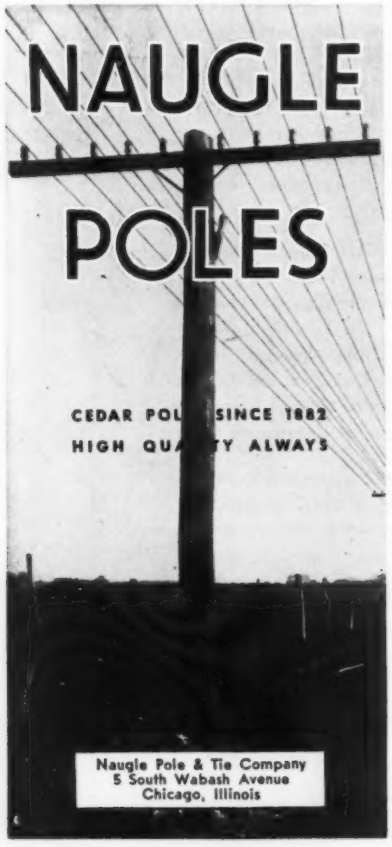
Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

Michigan Commission Taking Up Bell Company Charges.

James B. Balch, newly-appointed chairman of the Michigan Public Commission, in announcing a hearing set for April 19 and 20 with the Michigan Bell Telephone Co., specified three phases of service to be considered: Meter charges on Detroit telephones, rehabilitation of farm telephone lines, and installation of the handset type telephones.

Figures prepared by Manfred K. Toeppen, engineer for the commission, show a great loss in patrons of the telephone company and vast amounts of idle equipment. The commission hopes to reach an agreement with the company whereby telephone service may be restored in hundreds of homes and rates cut.

Mr. Toeppen's figures show the number of telephones in service in Detroit dropped from 351,000 on December 31, 1929, to 238,800 on December 1, 1933, or a loss of 112,800 customers, nearly one-third of the company's patronage in the state's largest city. The resultant idle equipment is lying in warehouses and producing no revenues for the company, experts declare.



On December 31, 1929, the company had 31,500 farm lines in use, according to Mr. Toeppen's figures. That total has been reduced to 18,500 customers or nearly a 50 per cent loss, he declares.

The company now has 117,000 handset telephones in use, for which an additional charge of $3 a year each is made.

The commission hopes to arrive at an agreement whereby Detroit subscribers will benefit by a reduced rate and thereby increase patronage for the company. Cost of the handset telephone is to be adjusted, the commission hopes. Farmers may be considered for new and lower rates in order to increase number of customers.

"This is no new attempt to adjust rates now in dispute in United States District Court in Detroit," Chairman Balch of the commission said. "We are suggesting the procedure in order to increase telephone service in the state, at what we hope will be altered schedules in favor of the subscribers, and increased income for the company."

Governor Comstock completed the membership of the commission before leaving for a vacation recently. The new members are Chairman Balch, Frank J. Sawyer of Grand Blanc, and Norman M. Snider.

This is the first move of the reconstructed commission to attack problems which have been before that body for years. It was learned that the commission expects to spend another $10,000 in whipping into shape the audit of the telephone company, which originally cost the state $520,000 and which was made useless by discharge of Mr. Toeppen who compiled it.

Mr. Toeppen has been rehired by the new commissioners and expects to complete the picture of the company's operations in order to provide information for the commission's fixing of rate schedules.

Commissioner Dissents on Order Requiring Valuation.

Railway Commissioner Bollen of Nebraska has filed a dissenting opinion in the case of the complaint of rural switched lines against existing rates at the Elgin exchange of the Citizens Telephone Co. of Blair, his dissent going to the action of his colleagues in ordering a valuation of the property before making any reduction in rates.

The complaints were filed more than a year ago, and at the hearing last September it became apparent that cost of furnishing the service would be the controlling factor. The company was ordered to furnish data, and Commissioner Bollen charges that in "doing so it submitted an inventory of its plant investment inflated from $25,514 to $40,257, and now admits it was submitted for the purpose of this particular case and to support its present switching rate."

The commissioner says he submitted the valuation of the property as shown by the books and reports on file, and that respondent's chief objection was that Mr. Bollen had used book values of 1929 plus additions and betterments, instead of the inflated values submitted. He says cross examination by the commission engineer developed there was absolutely no foundation for these inflated values and that they were pulled down from the clear sky.

In view of that fact, the commissioner said he would withdraw from further participation in the proceedings except to concur or dissent from any order that the other commissioners may make, being of the opinion that a valuation at this time would serve no useful purpose.

Mr. Bollen says that Commissioner Randall is contending for what he calls a startling rule—one that no commission of standing has ever announced—which is that traffic expenses should be allocated on a per station basis on the theory of readiness and willingness to serve.

He submitted findings of valuation, and an order reducing switching rates from $6 per station per year to $5 per station was suggested. He said this would give a return in excess of 10 per cent where 7 per cent is reasonable. He added that it was immaterial that the Elgin exchange itself is not now making a fair return since the rule of established law is that the rate should be sufficient to constitute proper compensation and that switched subscribers should not be required to contribute more than their reasonable share of the cost of the service which they receive.

Pennsylvania Commission Limits Utilities to 6 Per Cent Return.

Acting to limit public utility profits through rates reduced to fit the lower income of consumers, the Pennsylvania Public Service Commission announced on April 3 that it would consider 6 per cent as a maximum fair return to the companies "so long as the present economic conditions exist."

For many years the commission has allowed 7 per cent as a fair return and has approved rates which would produce net earnings of 7 per cent on the value of the companies' properties.

High-earning companies which in 1933 earned more than 6 per cent profit, will be called into conference with the commission in an effort to obtain voluntary rate cuts by the companies. If they refuse, the commission has authority to start a rate suit against them of its own motion.

Companies whose earnings during the depression years have failed to reach 6 per cent are to be exempt from requests to lower their rates to consumers.

The utility corporations upon whom pressure will be brought by the commission will be selected from 4,200 companies which have filed their 1933 reports with the rate-fixing board.

Officials of the commission described its action in seeking a sweeping downward revision of rates as the most "far-reaching and significant step" ever taken by the Pennsylvania utility control board. It is more far-reaching than a resolution adopted in April, 1932, under which the commission first began its plan of conference with utility officials in an effort to obtain rate reductions by amicable methods.

Minnesota Company Refused Permission to Invade Territory.

The Minnesota Railroad & Warehouse Commission has issued an order refusing the Bear River Valley Rural Telephone Co. authority to move its central office from the village of Bear River, Minn., to Side Lake, a distance of approximately 18 miles.

The commission held that to approve the application of the Bear River company would create an invasion of territory as Side Lake in French township, St. Louis county, is already adequately furnished with telephone service by the French Township Telephone System.

From evidence presented at the hearing it developed that the Bear River Valley Rural Telephone Co. was organized in 1915 for the purpose of rendering a complete telephone service to the rural communities adjacent to the village of Bear River. On May 1, 1933, due to a disagreement between the company and the townships' supervisors, the telephone lines owned by the townships of Bearville, Carpenter and Marcom were disconnected from the company's switchboard, the local service rendered by the company being comprised exclusively of switching lines of these townships.

Upon their being disconnected, the company no longer having any business attached, closed its central office and established a pay station service in the village of Bear River and at two or three points on Side Lake. There is a small group of summer residences located at Side Lake and immediate vicinity which is in the territory operated by the French Township Telephone System.

There was no evidence presented at the hearing, either by the Bear River company or the summer people from Side Lake, to indicate that there was a demand for service from the Bear River company. On the contrary, members of the board of the township of French and people living in that district opposed such a move, the board of supervisors objecting on the grounds that it constituted an invasion of their territory.

The local people objected on the grounds that they were now adequately served by the French Township Telephone System and that public convenience and necessity does not require another telephone company in the field.

Holding "that public convenience and necessity does not require more than one local telephone system" to render adequate service in the territory involved, the commission dismissed the application of the Bear River company.

Many Wisconsin "Roadway" Lines Are Public Utilities.

Any telephone organization in Wisconsin that connects its line with a telephone company serving the public generally becomes a public utility and is subject to jurisdiction of the Wisconsin Public Service Commission, the commission's legal department has advised the Manawa and Royalton-Weyauwega Telephone companies.

Many of the 429 so-called "roadway" telephone lines in Wisconsin, including the many short lines organized within a farm neighborhood, will be affected by the ruling because they are connected with telephone lines giving general service.

"Roadway" telephone lines are usually organized merely to permit a group of farm neighbors to talk among themselves, the commission said.

The commission ruled that its approval must be sought by the 15 owners and subscribers wishing to sell the Royalton-Weyauwega Telephone Co. to the Manawa Telephone Co.

Wisconsin Utility Can Purchase Bank Stock, Ruling.

No legal prohibition exists against a privately-owned public utility's acquiring stock in a bank, the legal department of the Wisconsin Public Service Commission informed J. H. Spengler, secretary of the Urban Telephone Co., Clintonville, on April 4.

A municipally-owned utility, the ruling added, may invest funds only in certain interest-bearing bonds, including bonds issued by the United States or any municipal corporation in Wisconsin.

"No such limitation seems to be applicable to privately-owned utilities," the ruling said.

Cross Examination of Commission Engineer in Wisconsin Case.

The hearing in the statewide investigation of the Wisconsin Telephone Co. before the Wisconsin Public Service Commission, was adjourned on April 10

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MY TASK

By Miss Anne Barnes,

Traveling Chief Operator, Iowa Independent Telephone Association, Des Moines, Iowa.

I heard a very interesting talk on the radio one morning recently on the subject, "My Task." I will pass on some of the thoughts to you.

"We all have a particular purpose in life. We should begin shaping our destiny where we are now. Our aim may be to do more worthwhile things some day but the present day is our time of preparation. So we should learn to do the thing we have to do now as well as we can. We must work toward our goal of desire."

Folks who eventually attain success had to accept the things their hands found to do as they traveled through life. There are no short cuts to success. In fact, we find that the road leading to success has many detours.

These detours are the things we meet in life that hinder our present progress on the high road of life, such as having some one to support, shortage of money, illness, and the like. We should not ignore these detours if they appear in our pathway. They are meant for us, but neither must we give up our desire to some day attain our goal. If we never attain it, another way equally worthwhile will be our duty.

Recently, while visiting an agency office I met a woman who had been in charge for 22 years. This is not unusual but *she was unusual* in that she had set aside her aim in life to take detours for her family. First, it was her mother who could not be left to fend for herself. If this had been all she might have been able to do later what she yearned to do. But her younger sister, who had gotten all the good breaks in the family, married. For a brief time, things brightened for this unselfish and self-sacrificing young woman who had never had an opportunity to live for herself.

When I called on her a short time ago she, probably, was traveling her last detour for her family and will more than likely never hit the high road on her own account in this life. Now she is making a home for her sister's two little girls and seeing that they get a good education.

A *good education—that* had always been her *own* heart's desire for *herself*. By taking over the care and education of these little girls she has allowed her own heart's desire for self to become deadened and from now on must be content to find its expression through the lives of these little girls rather than her own. May they never disappoint her.

until April 17 when Theodore Kronshage, chairman of the commission who has been ill, was expected to attend.

Cyrus G. Hill, engineer for the commission, on April 10 completed three days of cross examination on his testimony of last year, which criticized the company for an $80,000,000 valuation. Mr. Hill contended that the company, which bases its rates on valuation, incorporated non-essential items in the report.

Correspondence showing that the Western Electric Co. had refused to tell the commission what it paid the Wisconsin Telephone Co. for calls, was introduced on April 10. Edwin S. Mack, counsel for the company, objected to introduction of the correspondence but Commissioner Hunt overruled the objection.

Chairman Hunt, at the hearing on April 4 in Milwaukee, refused to strike out testimony of Mr. Hill, to the effect that an excess valuation of $378,399 had been placed by the company on underground cables in Milwaukee.

Frederic Sammond, attorney for the Wisconsin company, argued that there were discrepancies in the figures submitted by Mr. Hill, but Mr. Hunt ruled that the company had not introduced sufficient evidence to prove that contention.

Admissions were drawn from Mr. Hill, under cross-examination by the company's lawyers, on April 5, that his valuations were based on 1929 quotations for equipment by the Western Electric Co.

Prices were higher in 1932, which is the year in question, it was intimated by the telephone company's lawyers.

The practice of the Wisconsin company of borrowing money from the parent American Telephone & Telegraph Co. at 6 per cent, while 5 per cent was the prevailing rate in 1932, according to Mr. Hill, was assailed by him.

The difference of 1 per cent made estimates of George F. Crowell, company engineer, $1,608,000 higher. Mr. Hill insisted that investors during 1932 were eager to loan their money with safety at rates as low as 3 per cent, and that many banks would have been willing to lend to the telephone company at much lower rates than 6 per cent.

Summary of Commission Rulings and Schedule of Hearings.

MICHIGAN.

April 19-20: Conference hearing with Michigan Bell Telephone at which three phases of telephone service were considered. These were: Meter charges on Detroit telephones, rehabilitation of farm telephone lines, and installation of handset telephones.

MISSOURI.

April 6: Order issued approving application of Carl Kind, operating as the Warrenton Telephone Co., to issue $2,000 mortgage refunding notes. The application was filed on April 5.

April 12: Petition dismissed of rural telephone subscribers of the Scotia Telephone Co., Washington, for reduction of telephone rates.

NEBRASKA.

April 9: In the matter of the order upon the Northwestern Bell Telephone Co. to submit evidence on the matter of fixing a depreciation rate for 1934; the commission finds that the amount in depreciation fund as of December 31 last is excessive, and orders that for the year 1934 the rate set up shall be 3.5 per cent.

April 11: In the matter of the order upon all telephone companies to show cause why the commission should not for the future require that an order of convenience and necessity be secured before any extension of existing lines or new construction which results in the invasion of territory now served; hearing held and matter taken under advisement.

NORTH DAKOTA.

April 3: Revised local exchange tariffs, filed by the Northwestern Bell Telephone Co. for Cathay, Fargo and Wyndmere, for service station switching, approved.

OHIO.

April 12: Application filed by the Damascus Telephone Co. for authority to increase rates 25 cents a month on party-line residence telephones in its exchanges at North Benton and Damascus. The new rates, it is declared, will apply to a total of 20 subscribers in the Damascus exchange and 113 at North Benton exchange.

WISCONSIN.

April 14: What is believed to be the first case in Wisconsin of a township's seeking to acquire a privately-owned public utility presented to the commission by L. A. Mineau, chairman of the town of Iron River, Bayfield county. The township seeks to acquire the Iron River Water, Light & Telephone Co. Mr. Mineau informed the commission in a letter.

April 17: Hearing at Milwaukee in the state-wide rate investigation of the Wisconsin Telephone Co. continued to this date from April 10.

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ADVERTISERS' INDEX

A

Acorn Insulated Wire Co..... 47
Albertson & Co., Inc., W. N.... 46
American Electric Co..25-26-27-28
American Automatic Electric Sales Company.....25-26-27-28
American Electrical Works.... —
American Steel & Wire Co....1-9
American Telephone & Telegraph Co..... —
Automatic Electric Co.25-26-27-28
Automatic Electric Co., Ltd... 45
Automatic Electric Sales Co., Ltd., The..... 45

B

Babcock, Garrison..... 1
Bartlett Mfg. Co..... 12
Bernz Co., Inc., Otto..... —
Berry Co., L. M..... —
Berry Solder Co., Inc..... —
Bond Electric Corporation.. .. 45
Boom Lake Cedar Co..... 45
Brach Mfg. Co., L. S..... —
Brazil Hollow Brick & Tile Company 45
British Insulated Cables, Ltd.. 8
Buckeye Tel. Supply Co..... 46
Burndy Engineering Co., Inc.. 40
Burroughs Adding Mach. Co.. 52

C

Calculagraph Co..... —
Carney & Co., B. J..... 45
Chance Company..... —
Chisholm-Ryder Co., Inc., Premax Sales Division..... 37
Churchill Cabinet Co..... —
Cleveland Time Clock & Service Company 45
Coffing Hoist Co..... 40
Coffey System & Audit Co..... —
Cook Electric Co..... 4
Cowling, Alfred E..... 45
Crescent Tool Co..... —
Cuneo Press, Inc., The..... —

D

Davey Tree Expert Co..... —
Donnelley & Sons, R. R..... 1

E

Electric Storage Battery Co... 2
Everstick Anchor Co..... 41

F

Forged Steel Products Co..... —
Fort Wayne Printing Co..... —
Fowle, Frank F..... 1
French Battery Co..... 45

G

General Cable Corp..... 11
General Dry Batteries, Inc.... —
General Electric Co..... 45
General Radio Co..... 1
Graybar Electric Co..... 10
Gray Telephone Pay Station Co. 35

H

Herdrich & Boggs..... 1

I

Independent Cord Co..... —
Indiana Steel & Wire Co..... 12
Inland Equipment Co..... —
International Harvester Co.... —

J

Johnston, J. K..... 32
Jordan Bros. Lumber Co..... 1

K

Kellogg Switchboard & Supply Co. 6-7
Klein & Sons, Mathias..... —

L

Lanz Bolt Co., M..... 47
Leich Electric Mfg. Co..... 37
Lenz Electric Mfg. Co..... 33

M

MacGillis & Gibbs Co..... 37
Michigan Pole & Tie Co..... 1

Mc

McGraw-Hill Book Co., Inc.... —

N

National Carbon Co..... 45
National Pole & Treating Co.. —
National Telephone Supply Co. —
Naugle Pole & Tie Co..... 46
North Electric Mfg. Co..... 45

O

Oliver Iron & Steel Corp..... —
Owens-Illinois Glass Co., Hemingray Division 5

P

Page & Hill Co..... 51
Phillips Electric Works, Ltd., Eugene F. 45
Porter, Inc., H. K..... 4

R

Rebuilt Electric Equipment Co. 46
Reliable Electric Co..... 12
Roebling's Sons Co., J. A..... —
Runzel Cord & Wire Co..... 45

S

Safety Tool Company..... 45
Saranac Glove Co..... 1
Schauer Machine Co..... 48
Seymour Smith & Son, Inc.... 51
Siemens Bros., Co., Ltd..... 45
Sigalet & Co., Ltd., H..... 45
Stromberg-Carlson Telo. Mfg.. 3
Suttle Equipment Co..... 46

T

Telefon Fabrik Automatic..... —
Telephone Engineering Co..... —
Telephone Engineering & Management Co..... 48
Telephone Repair Shop..... .. 46
Telkor, Inc..... 42

U

Union Carbide and Carbon Corp. 45
Utilities Service Co., Inc..... —

V

Valentine Clark Corporation... 45
Veeder-Root Co., Inc..... —

W

Western Electric Co..... —
Weston Elec'l Inst. Corp..... 39
Whitney Blake Co..... 41
Wray & Co., J. G..... 1

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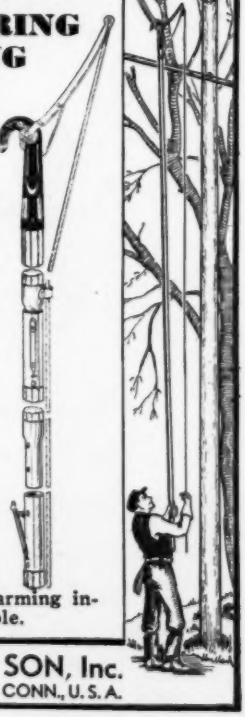

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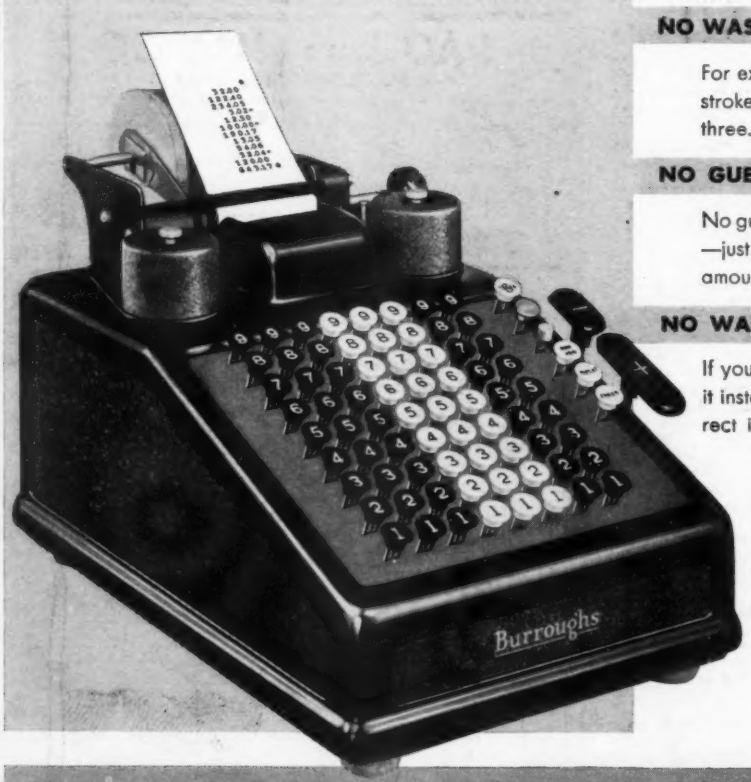

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CHICAGO, APRIL 28, 1934

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How important it is that this equipment be kept up-to-date. Nothing is better suited to the purpose than the *new* Stromberg-Carlson 1191 Handset. It is a one-piece handset with ringer, induction coil and condenser mounted in the base. It completely does away with the unsightly desk set box.

The 1191 Handset is attractive in appearance and comfortable to use. The instrument costs you less money for equipment, installation and maintenance than the 2-piece set and at the same time brings you the added revenue of handset service. It establishes new standards in transmission and reception qualities.

Order a sample. Test it under your most exacting requirements. You will then realize what a wonderful builder of good will this instrument is.

Stromberg-Carlson 1191 Handset . . . ringer, induction coil and condenser mounted in base of instrument, making it completely self-contained and doing away with desk set box.

Stromberg-Carlson Telephone Mfg. Co.

Factory and General Offices:
100 CARLSON ROAD, ROCHESTER, N. Y., U. S. A.

Branch Offices:
CHICAGO, KANSAS CITY, SAN FRANCISCO, LOS ANGELES, SEATTLE, TORONTO, ATLANTA

Stromberg-Carlson

MAKERS OF VOICE TRANSMISSION AND VOICE RECEPTION APPARATUS FOR MORE THAN THIRTY-FIVE YEARS

Make Your Community Want Telephone Service

The 3-panel display poster as illustrated below is mounted in a black metal folding frame, or, if desired, they will be furnished easeled, in which case no frame is necessary.

THAT is the purpose of these attractive, attention-commanding Window and Lobby Displays. If your quarters will not accommodate a poster of this size, get the Center Panel only or a Wall Display. All are moderate in cost and are printed in 8 or 9 brilliant oil paint colors. They are designed by experienced poster artists and have proven their ability to increase the business of telephone companies in both large and small communities.

A new design is created and distributed monthly to all subscribers of this service. Write, wire or telephone for prices and additional information.

NOTICE!
REDUCED PRICES ON THESE POSTERS GO INTO EFFECT MARCH 1.

Telephony Publishing Corporation
Telephone: Wabash 8604
608 S. Dearborn St., Chicago, Ill.

. . . An extension telephone costs only a few cents a day !
Oh mother, TELEPHONE!
Extension telephones conveniently located save miles of steps.
. . . . Let your telephone climb the stairs !

Also available: Center panel only and Counter or Wall Display. Prices on request.

XUM

SUBSCRIBERS SAY:

IT'S A PLEASURE TO TALK OVER THE KELLOGG MasterphonE

Office of Secretary

Citizens' Mutual Telephone Co.

Bloomfield, Iowa

March 26th, 1934.

Mr. F.B. Knefel
Kellogg Switchboard & Supply Company,
1131 W. 35th Street,
Des Moines, Iowa.

Dear Mr. Knefel:

I thought you would be interested to learn of the results of some tests made on the Masterphone telephones in our plant. Some time ago I started a series of practical tests, using your Masterphones with the new triad circuit. I am greatly pleased with the results of these tests.

The transmission volume is equal to, or better than the standard booster type circuits.

The absence of side tone is a very desirable feature; room noises do not interfere with the user of the telephone; side tone interference is a bug bear to the telephone man. In the old style booster type circuits the booster effect was destroyed when side tone was reduced.

With the Masterphone triad circuit the voice is clear and distinct with the subscriber talking in a low tone, as it is possible to get the full booster effect and the same time not have the objectionable side tone which is present with the old style circuits.

✓ Our subscribers are very well pleased with these telephones, and report to us that it is a pleasure to talk over these telephones.

I have been in the telephone business for over thirty years, and I consider the Masterphone and triad circuit the greatest development in instrument design, and circuit performance during this period.

Naturally triad circuits, and Masterphones have won our approval.

Yours very truly,
A.L. Rupe
A.L. Rupe
Wire chief

KELLOGG SWITCHBOARD & SUPPLY COMPANY, CHICAGO

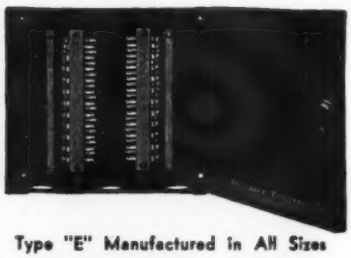
KELLOGG MasterphonE

H THE ONLY REAL NON-POSITIONAL TRANSMITTER AND TRIAD-BALANCED CIRCUIT

When communicating with Kellogg Switchboard & Supply Co., please mention TELEPHONY.

XUM

STEEL BUILDING BOXES



Type "E" Manufactured in All Sizes

NEATLY DESIGNED.

NUMEROUS KNOCKOUTS AT TOP AND BOTTOM.

SCREW BINDING POSTS FOR DISTRIBUTING WIRES.

SOLDERING TERMINALS FOR CABLE WIRES.

Reliable Electric Company

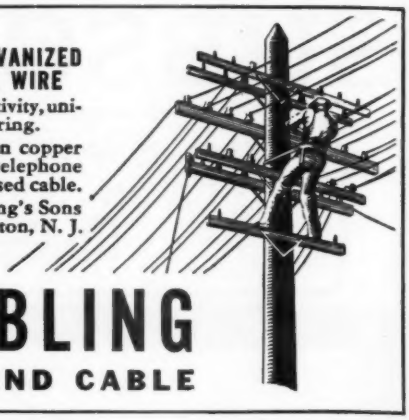
3145 CARROLL AVE. CHICAGO, ILL.

DOUBLE GALVANIZED TELEPHONE WIRE

High in conductivity, uniform, easy to string.

Also hard drawn copper wire, interior telephone wire, lead encased cable.

John A. Roebling's Sons Company, Trenton, N. J.

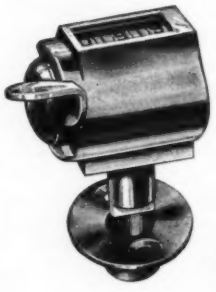


ROEBLING

WIRE AND CABLE

Veeder-Root TELEPHONE

Switchboard Counter



Counts the Calls:—enables you to take periodic counts; shows you the volume handled by each operator. Sets into permanent socket in the keyboard, registers one for each press.

Keeping count of calls handled daily means keeping informed on traffic tendencies — keeping ahead of service requirements. *Send for circular.*

Veeder-Root INCORPORATED HARTFORD, CONN.

Economical
Convenient
Dependable

RAY-O-VAC

TRANSMITTER BATTERY

OUTSTANDING economy in use, dependability, and convenient size make the Ray-O-Vac Transmitter Battery ideal for magneto operated central offices. This battery offers long service capacity, and consequently *low cost per service hour*. Throughout its long life, it provides a notably uniform voltage, due to a special mix formula. Designed particularly for use at operators' positions on telephone switchboards, the Ray-O-Vac Transmitter Battery is so compact, light and small that it may be installed within the switchboard if desired.

RAY-O-VAC COMPANY

(Formerly French Battery Company)

Factory and General Offices: Madison, Wisconsin

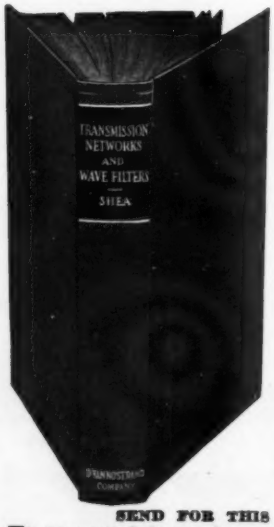
Manufacturers also of Ray-O-Vac Rotomatic and Standard Flashlights and Flashlight Batteries

TRANSMISSION NETWORKS AND WAVE FILTERS

By

T. E. SHEA, B. S., M. S.

Member of the Technical Staff, Bell Telephone Laboratories



The calculation and design of telephone networks and wave filters are fully presented in this book, written by Mr. T. E. Shea of Bell Telephone Laboratories. It embodies the most recent developments in this field as well as the standard practice.

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